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 and less gas. Toyota's revolutionary new Hybrid Synergy Drive ${ }^{*}$ combines a gasoline engine with a powerful electric motor that never needs to be plugged in.The result? Super-efficient, super-charged performance.
For example, Hybrid Synergy Drive will inject a V6 SUV with the power and torque of a V8. Remarkably, the SUV will also achieve the average fuel efficiency of a compact car with a fraction of conventional emissions. This groundbreaking yet affordable technology will hit the roads this fall in the next generation Prius.

And after that, it will be available in more and more Toyota products - including SUVs.
One day, all cars may be quicker off the mark. And slower to leave a mark.

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## FEATURES

2 Saudi Arabia on Edge Tribal traditions and modern wealth clash in the birthplace of Islam-a kingdom in the political hot seat since 9/11.
BY FRANK VIVIANO PHOTOGRAPH5 BY REZA
42 Kinkajous Living on fruits and flowers, these rarely seen relatives of the raccoon prowl the high rain forest canopies of Central and South America.
EY HOLLY MENINO PHOTOGRAPHS BY MATTIAS KLUM
58 Iraq's Antiquities War When the spring offensive by U.S.-led forces ended, another battle began: the fight to preserve Iraq's ancient sites and artifacts from looters. A team of archaeologists races from Baghdad to Babylon to report from the field.
by andrew lawler photographs ay steve mccurry and randy olson
76 Orangutans Hang Tough Revisiting Borneo, an anthropologist checks in with some old friends and worries about their future.
ay cheryl knott photographs by tim laman
82 Maya Water World Divers and scientists probe Yucatán sinkholes, sacred to the Maya, where human sacrifices ensured cosmic order. BY PRIIT J. VESILIND PHOTOGRAPHS EY WES SKILES

102 Mongolian Crossing In a remote, mountainous corner of Asia, nomads still follow their herds on an arduous migration. If given the choice, will they take a new path?
BY GLENN HODGES PHOTOGRAPHS EY GORDON WILTSIE
122 ZipUSA: 05641 Resting in peace, Barre, Vermont, is a little town with a reputation carved in stone.
8Y MARGARET G. ZACKOWITZ PHOTOGRAPHS BY CARY WOLINSKY

## DEPARTMENTS

OnScreen \& Online From the Editor Forum Geographica Behind the Scenes Who Knew?<br>\section*{Final Edit}<br>On Assignment Flashback

## THE COVER

Prince Mishaal bin Abdul Aziz of Saudi Arabia performs a ritual sword dance to conclude a camel festival. by reza
(9) Cover pilinted on recycled content paper

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## WISH UPON A STAR



PROFITS \& PRINCIPLES

The sun holds such bright promise as
a clean, renewable energy source. And yet for years, it's remained out of reach. Clean, yet too expensive. So the question is: Do we follow the sun or just turn out the lights and go home?

## OR MAKE A DREAM COME TRUE?



Ignoring alternative energy is no alternative. Fossil fuels are going to remain the major source of energy for the foreseeable future, but we are also working on new energy technologies. Keeping pace with the world's accelerating demand for energy and supplying power
to remote areas require Shell to pursue renewable resources like solar and wind energy. We established Shell Renewables with a commitment to develop these new opportunities commercially. One of our goals is to make solar energy cheaper, more efficient and more accessible, both for businesses and homes. It's part of our commitment to sustainable development, balancing economic progress with environmental care and social responsibility. So with real goals and investment, energy from the sun can be more than just a daydream.

# OnScreen \& Online 

## National Geographic Channel

PREMIERES MONDAY, OCT. 6, 8 P.M.ET/PT

## Worlds Apart mate vipeat

American family, transplant them to a remote village in Kenya (right), India, or Ghana, and watch what happens. This 13-part reality series presents the triais and triumphs of families as they deal with exotic foods, customs, and ways of looking at the world. For the season premiere,
 a Virginia family moves to a fishing village in Papua New Guinea and learns to live like the neighbors-with canoes for transportation, huts for homes, and a steady diet of fish and yams.


NATIONAL GEOGRAPHIC CHANNEL, SATURDAY, OCT. 25, 6 P.M. ET, 3 P.M. PT
Through the LenS Leap out of an airplane (left), swim with sharks, or descend into the crater of an active volcano with nine adventure photographers as they describe what they go through to get that one "killer shot."

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MONDAYS, 9 P.M. ET/PT

## Taboo

What's forbidden or strange in one culture is often part of everyday life in another. The second season of Taboo features a Berber marriage market, the witches of Ghana, full-body tattoos, and a stew of culinary delights from goat fetus to ram's eyeballs.

Channel and NGT\&F programming information accurate at press time; consult local listings or the Society's website at nationalgeographic.com

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ASK CHERYL KNOTT Post your questions for the author of this month's story (page 76). $\quad$ BIo AND RESOURCEs Learn more about Cheryl and these endangered apes, nationalgeographic.com/ngm/0310

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## Fighting Back with Aricept

## I love my life way too much to just hand it over to Alzheimer's.

When my memory started failing, I knew I had to see my doctor. He put me on ARICEPT." Now I'm doing better.*

If a person forgets names, places or facts and has trouble with everyday things like reading II shopping - it may not be normal aging. It could be Alzheimer's disease. So it's important to see doctor as soon as you can.

There is no cure for Alzheimer's. But a prescription drug called ARICEPT has been used by millions of people to help their symptoms.

In studies, ARICEPT has been proven to work for mild to moderate Alzheimer's. It has helped people improve their memory over time. It has also helped them to keep doing everyday things on their own, longer.
Ask your doctor if ARICEPT is right for you or your loved one. It is the \#1 prescribed drug for Alzheimer's in the world. The sooner you know it's Alzheimer's, the sooner ARICEPT* can help.

## $\frac{\text { ONCE-A-DAY }}{\text { ARCABPI }}$ (donepezil HCl)

## Strength in the face of Alzheimer's ${ }^{\text {™ }}$

To learn more and to receive a memory checklist, call 800-760-6029 ext. 55 or visit www.aricept.com

*Indivinuai responses to ARICEPT can be different people may get better, stay the same of not get better

#  <br>  

## ARICEPT* (Donepezil Hydrochloride Tablats


 durlepezil thydrachloride ol lo piperidine derivalives. WARNINGS Anesthesfa: ARICEPT" as a
 Gamiovascular Condilions: Because of their phamacological action, chotinestepase inhibitoss may have vagulonic effects on Ihe sincatrial and alrigventriculas nodes. This pffect may manilest as bradycardia or heart black in patients bolli will and withoul known underbing eardiac conduction abnomalilies. Syntopal episodes thave been reported in association with lhe use of ARtCEPT

 Hsk tor developing ulcers, ag. those wilh a hiskory of thogr disease of liose receiving concuren manslerondal anti- intiammalory drugs (NSADSS) Clintial stedies of ARICEFT have shown mo inctease ielaluve in placebo, in the inctuence of bither peptic theas disease or gaslroinlestinal bleeding proctuce diar a predidibie consequence of is pharmacological properlies, has bean shaw with the 10 minfay ifose than with the $5 \mathrm{~mm} / \mathrm{day}$ dose In most cases, these eflects tave been mild and transment, sometimes lasthy ohe 10 iliree weaks, and have resolvad during Eontinued use of ARICEP T




 disease. PRECAUTIONS Drug-Drug Enterations Drugs Highty Sound to Phesma Protoins:
 olther drugs sudkt as laresemide, digoxin, and wartans AGICEPT al concentrations of 0.3-10
 by lurosemide, difoxin, anu warlanin. Effert of AhICEPF on the Meftholism of Other Druss:

 show a low rale of binding io these, entymes (mean K; aboul $50-130$ jaly), that. given the therappertic pasicma concertrations of donepezit ( 64 nM ), Indicales litte likelihood of interference Whethet





 A sytuenislic effecl may be expectad wher cholineslerase inhibitors are given conetrrently with
 Garcinoqenesis, Mulansnesis, Impainmem of Fertility Carcinggenicity gladies of thoneperi have nol twert completed. Donepert was not multagenic, in the Ames reverse mulation assiy in


 the maxithuith fecoumituded huttiln dose on a midm' basis) Pregnancy Pragnancy Catogay E:

 10 noyfuy/day \{approximalely 16 limes the maximum recommended hufixan dose on a mo/mi basis\} did set disclose ary ovidence for a teratogence potential ol doneperis However, in a shofy in which
 crase on a mg/tr basts) from day $1 /$ ol gesalron through day 20 pastpathurn, there was a slight nerease In silil birlis tint a sitgil docrease in pup survival hirough day i posipatum al lins dose, the next lower doce tested was $3 \mathrm{mg} / \mathrm{kg} / \mathrm{day}$. Thete are no adequate or welt-controlled studits in pregnanl wenven ARICEPT - sheula be used dufing pregnancy only it the polential benefil juslifies the potenlial nask es

 ADVERSE REACTHONS Adverse Events Leading to Diseomitimation The pates of discontintialion


 al $13 \%$ the mosl common adverse events leading lo discominualion, delined as blose occutring in
al fasi $2 \%$ al patignls ind al wice the menturer semeth placebo patients, ate shown in
Table 1. Most Frequent Adverse cvents Leading to With rawal
Table 1. Most Frequent Adverse Events Leading to With
Irom Controlled Clinical Trials by Dose Group

| Dose Group | Placebo | $5 \mathrm{mg} /$ day ${ }^{\text {ARICEPT* }}$ | 10 ron/day APIICEPT* |
| :---: | :---: | :---: | :---: |
| Patients Randomized | 355 | 350 | 315 |
| Event\% Oiscontinulan |  |  |  |
| Nausea | 1\% | 1\% | 3\% |
| Diathemat | 0\% | <1\% | 3\% |
| Vormiling | \% | \% | 2\% |

## Mosi Frequeni Atrerse Cintest Events Seen in Assceition with the tre af ARICEPT*



 adverse evanls ware ollen ot mitd trtensily and transient. resolving during cantinued ARICEPTa trealmant without lhe need for dose motilication. There is evidence to suggest that the frequency of hese costumon adverse everits may be alfected ty the eate of littation. An open-tabel sludy was conducled with 269 palients who recerverd placebo in the 15 - and 30 -weck studies These palients were fitraled lo a dase of $10 \mathrm{mg} / \mathrm{day}$ over a 6 week period the rater ol common adverse events were lower Wan those sean in patients titrated to 10 ong/day oves one week in the chntrollad clinsical lifats and were comparable to linose seen in platients on 5 ruyday See Table 2 for a compasisor of the ithost common atherse avertls toliowing one and six wsek titration regimens

Table 2. Comparison of Rales of Adverse Events ia Patients

|  | No ftration |  | $\begin{aligned} & \text { One-week tiration } \\ & \text { tomotiay } \\ & (6=525) \end{aligned}$ | $\begin{gathered} \text { Siz-meed itralion } \\ 10 \text { mondoly } \\ (n=269) \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: |
| Adverse Evant | $\begin{aligned} & \text { Placebo } \\ & (n=355) \end{aligned}$ | $\begin{aligned} & 5 m / d a y \\ & (n=511) \end{aligned}$ |  |  |
| Nausea | 6\% | $5 \%$ | 15\% | 6\% |
| Diarring | 5\% | 8\% | 15\% | 9\% |
| lasomitia | 6\% | 6\% | 14\% | 6\% |
| Fatifure | $3 \%$ | 440 | 8\% | $3{ }^{\text {\% }}$ |
| Vamtiting | 3\% | 3\% | 8\% | 5\% |
| Mujstie (aumps | 2\% | 6\% | 8\% | $3 \%$ |
| Arorexia | 2\% | 3\% | 7\% | 3\% |

Anorexia
Adverse Events Repated in Contralled Trials lhe events ciled rellect expentence gained under
dosely monitored conditions of clinicat trials in a highly selected patient populalion. In actual clirtical
pratice ot in uther clinical trials, these frequency eslimates may nol apply, the conditions of use repoting behavior, and the kinds of patients leated may ditfer Jable 3 lists luearnent emetnent signs and simptoms that wete reported in al least $2 \%$ of patients it plambo controlled lifats who received



Table 3. Adverse Events Reparted in Coniralled Clinieal Trials in at Least 2\% of Pationts Recoiving ARICEPT (donepezil MCI) and at a Higher Frequency Ihan

Placebo-Ireated Patients

## Body System/Alverse Event

Percent of Pationts with any Adverse Event andy as a whole
Headache
Pain, various localions
Accidenl
Fatique
Cardiovascular Syatem
Syncupe
Dipestive Syetem
Nausea
Vomiting
Antorexia


Hemic and Lymphatic Sydem
Melabolic and Mutrittoasl Sysums
Werghl Dectease
Musculoskedetal Sysiem
Muscle Crampos
Arlbritis
Mervous Syztem
Insominia
Diziness
Depression
Alsnomal Dreans

## Uroganilal System

Other Adverse Events Ouserved Doring Clinical Trials ARICEPT has toen adminuslared lo
 seated for at leas: 3 monlls and more than 1000 paltents have been trealso mat leasl 6 morths.



 andislo open-tabel trats in the Uriled Stales wetr Jecorded as adverse evenis by the clinical

 actuss all strodips These ralponries are used in the lisling betaw The frenuencies represent the proportion of 900 palients from these trials who experienced lat evera whute receivinil ARICEPT* All adwarse events occuiting al least bwice are included, bxcupl lor those already listed in tatles 2 or 3
 by body system and listed using the foldowing delinitions frafuent adwisa events- liose occurting in at least $1 / 100$ patients: mfrepuent adverss owonts- hose occiuring in $1 / 160$ to $1 / 1000$ pationls.
 events werp seen in sludies tumducled oulside the United Slates aody as a whole: frepuent: Influmrar.
 chits, generalized coldness, head iuliness, IIstersness. Cardiovaremar System: Fieyuont:

 perinheral vascular dispase, suplaveriliculal rathycardia, depp vein thombusts Dlpeslive System;
 gimgivis, increased appetite, lialulenes, periodontal absoess, cholelibiasis, diveticultits, drooling, dry



 Intreysem mascle wazaness, muscie lascorwather Morvous System: Frequent delusions Iremor, isnitability, paresthesia angression, vertigo, alaxie, incrased libito, restlessnass, abmolithal cryirg,
 allack, emotional labilily, neviralgia, coldness (localized), musele spassm, dysphouia, gail atinormaily.





 infrepuen: dry eyes, glaucoma, eamache, timatus, blepharilis, oecreasud hearing, relinal humorfage, eyes. Uroganilal System; Frequent: unimary incontinence, nadlufia; mfrequant dysuria, heymaturlat,
 bladdet, breast libuadenosis, librecysilt breasl, maslitis, pyuria, renal taidure, vapimitis. Postintrotuction Roports Votunlary reports of adverse svents temporally associaled with A ARICEP
 agitation, cholotysilis, confusion, convulsums, laillucinssions, heart block (all vppes) lyemulyic anema, hepaldis hyponalfesnia neuruleptic malignam symbrome, pancrealdis, and rash OVERDOSAGE aecause siralegies for the manamemoni of overiose are conlinually ovolving, it is for the managemant of an overiose of any drum. As in any case ol overtose oeneral sungonfive

 if respiralery muscles are Involved. Tertiany anticholnaergies such as alropmene may be used as all

 resporises in blood gressure and heart rate have been reporked with other thalinomintrelics when coadminislered with qualernaty anticholinergics such as glycopyrrolate. II is not known whelher ARICEPT" andfor ils metatholites can wiemoved by dialysis mimnodialysis, peritoneal dialysis, on prone posision, staggening galt, laciomalion, clonic romulsions. depressed respiration, salvation, masis, femors, lascitulafian and lower body suiface lemperslure
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NATIONAL GEOGRAPHIC
CHANNEL

## From the Editor



SAUDI ARABIA．What do those words bring to mind？ An ocean of sand？Oil？Mecca？Al Qaeda？If you＇re like many Westerners，that pretty much sums it up．
But I＇m hoping this month＇s cover story will change all that． You may recall that in December 2001 we ran a landmark story on Abraham，the biblical patriarch revered by Muslims，Christians， and Jews．Coming just a few months after $9 / 11$ ，that story－with photos by longtime contributor Reza（above，transcribing poetry with Saudi tribesmen）－reminded us all of the rich spiritual tradi－ tion that Islam shares with the West．It also opened a rare window of opportunity for the magazine．Following up leads generated by Reza＇s Abraham coverage in Mecca，we won access for Reza and author Frank Viviano to travel extensively throughout Saudi Arabia，epicenter of the Muslim world and one of the most closed societies on Earth．Their story，which begins on page 2，is essential reading for those who won＇t settle for stereotypes．


[^0]WILLIAM L．ALLEN<br>Editor in Chicf

BERNARD OHIANIAN，Asscriate Editar ROBEKT L BOOTHI，Managing liditor

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## YOUR ALASKA ADVENTURE STARTS ON PAGE ONE.

# Forum 

## June 2003

For a magazine filled with photegraphy, the (ifociraphu: uswally doesn't get a lol of mail about photographs. But Jume's pictures set off a few sparks: Bill Allard's images of
 Untouchables inspired an inquiry about adopting a little girl and offers of help for a man disfigured by acid, while Jim Brandenourg's photos of Minnesota's Boumdary Waters triggered a small delmee (sec next page).

## India's Untouchables

I thought there could not be anything else that would shock me about man's cruelty to his fellow man. I see that I was sorely wrong.

SAM MARKS
Amelan Istamid. Floridas

Tom ()'Neill describes a Brahman who snubs the lower classes. This Brahman's fundamentalist view of Hindu life does not necessarily reflect accurately the beliefs revealed in the Vedas (Hindu sacred texts) or the beliefs upheld by most Indians. Ask a swami (a teacher of Hindu philosophy) what he thinks about Untouchability, and he will tell you that he abhors it. In recent years, journalists have deped Westerners into believing that Islam is a religion of violence, misogyny, and intolerance. These journalists only focus on fundamentalist interpretations.

## FOR MORE INFORMATION

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O'Neill has made a similar mistake in his radical depiction of Ilindu philosophy. Such mistakes promote divisions that have proved incredibly detrimental to world peace.

JOHN-MICHAEI, PARIESSOTI New Orlerths, Iomisiana

We Indians take great pride in saying we are the largest democracy in the world, but we continue to deny human rights to these unfortunate people. If Indians want to become a part of the civilized world, we must not allow the scourge of Untouchability to exist.

PATRES. RAIASHEKHAR
Bangalore, Itrdin
This article uses Untouchability as a tool to make yet another attack on a country from which the West has taken so much and given back so little. A country that has suffered from centuries of imperialist exploitation, with a population of a billion plus, will need time to change.

> RAllv NAG
> Srate College, Pemmshluania

As an Indian and a Hindu, I found myself burning in embarrassment as I read your article. The root of the problem lies in

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## Boundary Waters Photos: Gorgeous or Greeting Cards?

Whatever in the blue-eyed world gave you the idea that National Geographic readers like artsy, out-offocus photographs? josiah manning Aurora, Missouri

Being both a photographer and a graphic designer, I was mesmerized by the composition and color of Jim Brandenburg's photography. His keen eye and sense of his surroundings created a delightful visual trip I shall take again and again.
pred kirby
Porter, Texus
I am absolutely astounded that you would allow such poorly

conceived and imaged photos into your magazine. Pictures such as these would be more at home on a greeting card. I subscribe because National. Grographic has consistently
and the neutral colors aren't neutral.

KEN HARRIS

New York, New York
Jim Brandenburg's photos are absolutely gorgeous! The pictures mixed the grace and softness of a watercolor with the clarity and sharpness of photography. They took my breath away. susie mengelt Clarkville, Indiana

The spread on pages 40-41 |left| looks like a bunch of mistakes set the highest standards in the imaging of non-studio photography. I hope this isn't a portent. These images are of substandard resolution and tonality. The colors are disturbingly digital and oversaturated,
pasted together. What a strange collection of pictures chosen to represent the physical beauty of the Boundary Waters Canoe Area.

JAMES G. LANDWEHR
Waukesha, Wisconsin
the Indian way of life. We are brought up to obey and never to question. Untouchability has plagued Indians for eons, and it will continue to do so as long as we don't liberate our minds and break free from parochial traditions. Thank you for shedding light on an issue most Indians sweep under the carpet.

JANANIE AUDIMULAM
Muar, Malaysia
I would like to point out that religions do not condemn people. Only people do. As a

## WRITE TO FORUM

National Geographic Magazine, PO Box 98199, Washingtan, DC 20090-8199, or by fax to 202-828-5460, or va the Internet to ngsforumenationalgeo graphic.com. Include name, address, and daytime telephone. Letters may be edited for clarity and length.
matter of fact, the Hindu scripture Bhagavad Gita clearly states: "The best person is one who feels the joy and suffering of others as his own because he sees the same soul in all . . . in a Brahman and in an eater-ofdogs." What condemns the poor Untouchables is not religion, but the hypocrisy of so-called high-caste Hindus. These racists are not Hindus.

PRAVIN SASHIDHARAN
Detroit, Michigan
To correct the evil of Untouchability, Indian politicians created another evil: the quota system, which reserves a percentage of positions in educational institutions and jobs in every sector for members of the so-called Untouchable castes. Today, because of these quotas, the dream of many meritorious

Indian students and professionals is to leave the country. And then the country whines about brain drain.
malika tangirala
Reading, Pennsylvania
I am haunted by the photo on page 9 of the worker covered in excrement with what seems to be the hint of a smile on his face. The dignity apparent in this man in the face of his circumstances is remarkable.

STANLEY DOSMAN
Kelowna, Brisish Columbia
Lest we Americans get too disgusted with the practices of Hindu Indians, we would do well to remember the racial injustices that have characterized most of American history: the genocide Europeans perpetrated upon the indigenous people of this land,


## WHAT ARE YOU DOING TO HELP PROTECT YOUR HEART?

You do all kinds of things to help safeguard yourself. And yet, if you've had a heart attack or stroke, it's important to ask your doctor if you're doing enough to help protect your heart. The Heart Protection Study by Oxford University, funded in part by Merck, researched ZOCOR.

ZOCOR is the first and only chotesterol medication proven to signiticantly reduce the risk of heart attack and stroke in people with heart disease. Regardless ill chotesterol level.

Before the Heart Protection Study was complete, zOCOR was a time-tested, chotesterol-lowering medication with over 160 million prescriptions filled in the past 11 years.

Ask your doctor how ZOCOR, along with a healthy diet, can help protect you. Get information about the Heart Protection Study and ZOCOR at zocor.com or call 1-800-MERCK-75.

Importent considerations: ZOCOR is a prescription medicine and isn't right for everyone, including women who are nursing or pregnant or who may become pregnant, anyone with liver problems, and people who are allergic to any ingredients of ZOCOR. Unexplained muscle pain or weakness could be a sign of a rare but serious side effect and should be reported to your doctor right away. Your doctor may do blood tests before and during treatment with zOCOR to check for tiver problems. To avoid serious side effects, discuss with your doctor medicine or food you should avoid while on ZOCOR.

PLEASE READ THE MORE DETAILED INFORMATION ABOUT ZOCOR

YOUR RESULTS MAY VARY.
ASK YOUR DOCTOR IF ZOCOR IS RIGHT FOR YOU. IMMEDLATELY FOLLOWING THIS AD.


# Zōcor (SIMVASTATIN) 


#### Abstract

PLEASE READ THIS SUMMARY CAREFULLY, THEN ASK YOUR DOCTOR ABOUT ZOCOR. NO ADVERTISEMENT CAN PROVIEE ALL THE INFORMATIOM NEEDED TO PRESCRIBE A DRUG. THIS adverisement does not take the place of careful dISCUSSIONS WITH YOUR DOCTOR. ONLY YOUR DOCTOR HAS the training to weigh the risks and benefits of a PAESCAIPTION ORUG FOR YOU.


## USES OF ZOCOH

ZOCOR is a prescription drug that is indicated as an addilion to diel tor many palients with hiugh chatesternl. For patients al high risk of coronary feant disease (CHD) because ol exisliryg limarl disease. diabetes, vascular disease, mislory of stroke, ZOCOR is iredicated along wilh diek to seduce the risk of dealh by reducing coronary death; reduce the risk ol hearl attack and stroke; and reduce the need for revascallarialion procedures.

## WHEN ZOCOR SHOULD NOT BE USED

Some prople should nol lake ZOCOR. Discuss this with your doctor
70COR should nol be used by patienis who are allergic to any ol its ing̣edients In addition to the active ingredient simastatin, each tablet contains the tollowing inaclive ingredienls celtutose, lactose, magnesium stearale, iron oxides, falc, Hfanium dioxide, and starch Bulylated hydroxyanisole is added as a preservative.
Patients with liver problems: $Z O C O R$ should not be used by palients with active liver disease ar repeated blood lest resulis modicating possible liver groblems. (See WARNINGS.)
Women who are or may become pregnant: Pregrant worten should nol lake ZOCOR because it may harm the lefus. Women of childbearing ape should not take zaCOR unless it is highly unilkely that they will become pregnant. II a woman does become pregrani while on 20 COR . she should slop taking the drut and laik 回 her doctor at once
Women who are breast-leeding should not take ZOCOR.

## warmings

Muscle: Tell your doctor right away li you experience any unexplained muscia pain, tenderness, or weakness at any time during trealmemt with ZOCOR so your doctor can decide it ZOCOR should be stopped. Some palients may have muscle patn or weakness while taking ZOCOR. Rarely, this can include muscle breakdown resulting In kidney damape. The rigk of muscle breakdown is greater in patients laking certain olher drugs along with ZOCOR:

- Cyclosporine, Iraconazole, ketoconazole, erythromycin, elarithromycin. HIV protease inhibitors, the anlidepressanl nefazodone, or larye quantuties of grapetruit juice ( $>1$ quart daily), particulariy with higher doses of 20COR.
- Gemflbrozil, other flbrates, or lipid-lowering doses ( $21 \mathrm{~g} / \mathrm{day}$ ) of niacin, partleularty with higher doses 1 ZOCOR.
- Amiodarone ar verapamil will higher doses of zOCOR.

The risk of muscle breakdown is greator al higher doses of simvastatin. Becausa the risk ol muscla side affects is greater when ZOCOR is used with the products listed above, the combined use of these producls should be avolded unless your doctor determines the benelits are likely to outwaigh the increased risks.
It your dector determines that the benefils of combined use of zocor with yemilbrozll, other libratas, or nlacin likaly outweigh the mereased risk of muscie problems, the dose of ZOCOR should nol exceed 10 mg daily. No more than $10 \mathrm{mg} /$ day of ZOCOR should be taken wilh cyclosporing.
The combined use of verapamil or amiotarons wilh doses above ZOCOR 20 mg should be aveided unless your doclor determines the benefits outwelgh the increased rist of muscle breakdown.
Your dectar should also carefuliy monitor for any muscle pain, tenderness, or weaknass, particularly during the initial months of therapy and $\boldsymbol{r}$ the dose of elther drug is increased. Your doctor also may monitor the leval it certain muscle enzymes in your body, but
there is no assurance that such monitaring will prevent the occurrence of severe muscie disease.
The risk of muscle hreakdown is greaier in patients with klidney problems or diabotes.
If you have conditions that can increase your risk of muscle breakdown, which in turn can cause kldney damage, your doctor should temporanlly whthold or stop 20COR" (simvastatin). Also, since there are no known adverse consequences of triefly stopping therapy with ZOCOR, treatment should be stopped a tew days before elective major surgery and when any major acute madical or surgical condition occurs. Discuss this whith your docter, who can explain these conditions to your.
Liver: About t\% of patients who took ZOCOR in ellnical trials developad alevated lavals of some liver enzymes. Palienils who had these incteases usually had no symploms. Elevaled lives entymes usually returined to normal levels when therapy with $20 C 0 \mathrm{R}$ was stopped
1t the $20 C O R$ Survival Study. The number ol patients wilh more than 1 liver
 diflerent between the 70 COR and placeto groups Ontly 8 palients on 70 COR and 5 un placebo disconlinued tlerapy due to elevaled liver enzyme levels Patierts wete started on 20 mg ol $Z 0 C O R$, and one third had their dose raised to 40 mg .
Your dactor shouid pertorm routine blood lests to check these enzymes before you start treatment with 20COR and thereatter when clinically Indicated. Pallents titraled to the $80-\mathrm{mg}$ dose should receive an additional lest at 3 months and periodically therealier (og. semiannually) for the lirst year ol treatment. If your enzyme levels increase, your doctor should order mote freputent tests It your liver entrymua levels rerrain unusually high, your doctor should discontimue your medicalion.
Tell yout doclor aboul any liver disease you may have had in the pasi and about how murh alcohol you consume. ZOCOR should be used wilh caulion in patients who consume large amounts of alcothol.

## PRECAUTIONS

Drug Interactions: Because of possibibe serious drug interaclions, It is tmpor-
 withoul a prescription You slrould also tell other doclors who ase prescribing a new medicine tor you that you ate taking $20 C 0 R$. ZOC.OA can inserart wilh the tollowing:

- liraconazole
- Keloconazole
- Enthromycin
- Clarilliranycir
- HIV protease inthìilors
- Nelazodone
- Cyctosparine
- Large quanlifies ol grapertuil juice (>1 quarl datly)

The risk of myopathy is also increased by the lollowing lipid-Ioweriry duygs that can cause myopallyy when given alone:

- Gernibrozil
- Other fibrates
- Niacin (nicotinic acid) (zı g/day)

The risk ol muscie breakdown is increased with olther duugs.

- Amiodarune
- Verapamif

Some patients laking lipid-lowering agents similar to ZOCOR and coumarin anticoagulants (a lype of blood lhinner) have expetienced bleeding and/or increased blood cloting time. Patients taking these medicines shoutd have their blood lested belore slarting therapy wilh $20 C O R$ and should conlinue to be monitored.
Central Marvous Sysiem Toxicity; Cancer, Mutations, Impalfment of Ferillity: Like most prescription drugs, zOCOF was required to be tasted on animals before it was marketed for human use. Otten these tests wete designed - achieve bighter drug concentralions than humans achieve ${ }^{\text {B }}$ recomimended dosing In sorme lests, the animals had damage to the naives in the cenifral nervous system. In sludies of mice with high doses of ZOCOR, the likelihood of certain types of cancerous fumbrs increased. No evidence of mutations of or damage to genelic material has been seen. In 1 study with ZOCOR, there was decreased lertility in male rats.
Pregnancy: Pregnant women should not take ZOCOR because it may harm the telus.
Sately in preatrancy has not been establistred. In studies wilth lipid-lowering agenls similar to $70 C O R$. there have been rare reports of birth deteeds of the skeleton and digestive system. Therefore, women al childbearing age should nol lake

ZOCOR* (simvastatin) unless it is highly unlikely they will become pregnant. It a woman does become pregnant while laking ZOCOR, she should stop takirg the drug and lalk to her doctor al once. The aclive ingredient of ZOCOR did rot cause birth defects in rats at 3 limes the human dose ti in rabbits at 3 times the human dose.

Nursing Mother: Drugs taken by nursing mothers may be present in their breasi milk. Because of the potential for serious adverse reactions in nursing inlants, a woman taking ZOCOR should not breasl-leed. (See WHEN ZOCOR SHOULD NOT BE USED.)
Pediatric Use: 70COR is not recommended for children or patients under 10 years ol age.
Gerlatric Use: Higher blood kevels ol active dfug were seen in elderty patients ( $70-78$ years of age) compared with younger patients ( $18-30$ years of age) in 1 study. In other sludies, the cholesterol-lowering etlecls of ZOCOR were - leasl as greal in elderly patients as in younger patients, and there were no overall differerices in salaty between elderly and younger palients oves the $20-80 \mathrm{mg} / \mathrm{day}$ dosage range. Of the 7 cases of myopalhy/thabdomyolysis among 10,269 palienls on ZOCOR in another study, 4 were aged Til or more (at baseline), 1 of whom was over 75.

## SIDE EFFECTS

Most patients Iolerale treament with ZOCOR wall; however, like all prescription drugs, ZOCOR can cause side effects, and some of them can ${ }^{-3}$ serious. Side effects that do nccur are uscally mild and shor-lived. Only your doctor can weigh lhe risks yersus the benelits of any prescription drua In clinical studies with 20COR, tess Ihan $1.5 \%$ of palients dropped out of the studies bracause of side eflects. In 2 large, 5 -year sturties, patients taking 20COR experienced similar side eflecis those patients taking placebo (sugar pills). Some of the side eftecls that have been reported with ZOCOR or related drugs are listed helow. This list is no! complete. B sure to ask your doclor aboul side etfects before laking ZOCOR and lo discuss any side effects that occur
Digestive System: Conslipation, diarrhea, upsel stomach, gas, heartburn, slomach pain/cramps, anorexia, loss of appalite, rausea, inilammation of the pancreas, hepatilis, faundice, tatly changes in the lives, and, rarely, severe liver danage and tailure, cirmosis, and liver cancer.
Muscle, Skeletal: Muscle cramps, aches, pain, and weakness; joint pain; muscle breakdown.
Nervous Syatem: Dizzinass, headache, insomnia, lingling, memory loss, damage to nerves causing weakness and/or loss of sensation and/or abnormal sensations, anxiely, depression, Iremor, loss ol balance, psychic disturbances.
8kin: Rash, itching, hair loss, dryness, nodules, discoloration
Eyo/sionses: Blurred vision, altered tasle sensation, progression of calaracls, eye muscle weakness.
Hypersonstitivity (Alorgle) Aasctions: On rare occasions, a wide vaisty ol symploms have been reported lo occur either alone or logelher in groups (relerred to as a syndrome) lhat appeared to be hased on allergic-lype reaclions, which may rarely be latal. These have included 1 or more of the lotlowing: a severe generalizad reaction that may include shortness of breath. wheezing, digestive symptoms, and low thood pressure and even shock; an allergic, reaction with swelling of the lace, lips, Iongue, and/or throat with difticully swallowing or breahing; symptoms mimicking lupus (a disorder in which a person's immune system may allack parts of his or her own body); severe muscle and blood vessel inilammation, somelimes including rash; bruises: various disorders of blood cells (thal could resull in anemia, infection, or blood clotting problems) abnormal blood tests: inilamed or painful joints; hives; latigue and weakness; sensitivity to sunlight; fever, chitls; thusting; difficulty breathing; and severe skin disorders that vary from rash to a serious burn-like shedding of skin all over the body, including mucous membranes such as the lining of the mouth.
Other: Loss of sexual desire, breasi enlargement, impolence.
Laboratory Tests: Liver function test abnormalities including elevated alkaline phosphatase and bilimbin; thyroid lunction abnormalities.
NOTE: Thls summary prowldes Importani intormation ahout ZOCOR. It you would like more informalion, ask your doctor or pharmacist to let you sead the prescribing information and then discuss it with them.


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the enslavement of Africans, the poor treatment of African Americans, and our continuing marginalization of people based on income, gender, and sexual orientation.

JOANNE M. DAVIS
Dollas, Texas

## Baghdad Before the Bombs

I didn't see any pictures of the mass graves filled with Saddann Hussein's victims. I didn't see any pictures of the people his son Uday dropped alive into a shredder, the government official whose teeth had been removed with pliers, or the family of the woman chopped up for talking to CNN. I guess that depicting the Iraq of Saddam Hussein was not something you or your reporter wanted to bother with.

DAN COTTO-THORNER
Naperville, Illinois

## Paving Peru

The idea that the construction of a paved highway through this part of the world would be an irrevocable loss is largely a product of people who have spent their lives driving on asphalt. It is easy for someone to lament the loss of a pristine ecosystem or corruption of an innocent culture after having viewed it on cable television. Traveling through the Andes on the roof of a cargo truck may seem rustic, but I'm sure it gets old when you live it and don't have a plane ticket home stashed in your backpack.

REX A. JACKMAN

Arcata, Cobliformia
I just finished the article, and I'm aghast at the last sentence: "These people, I thought, need a better road." This is tantamount to saying that National. Geggaphic believes in illegal harvesting of mahogany, more cars, burning of fossil fuels, indescribable pollution, and habitat destruction. And how about 7 -Flevens bordering the rain forest as well? And the heck with the indigenous cultures too.

BOB FEIT
Chesapeake, Virginia FROM OUR ONLINE FORUM nationalgeographic.com/ngm/0306

I grew up in Bolivia on the Beni River. When I was a child, my missionary father told me to relish and never forget what I was seeing,

## Attention oolleotorsy

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because it would never be the same. While I ache for the world of memories that your article stirred, I know the people of Peru yearn for the advances that the road can bring. I also know all too well the discomfort and danger of living in remote jungle settlements. 1 support neither the voracious appetite of irresponsible industry nor the silly environmentalists who believe any alarmist's tale.

STEVE OTTTAVIANO
Waxhaw, North Carolina

## Siberian Gold

If I were to take shovel in hand and invade the pioneer cemetery in my community, even for strictly scientific purposes, I would probably face arrest for grave robbing. Just how are archacologists who root around in ancient burial grounds and cart off the contents any different? Is it just that the ancients no longer have someone around to protect their remains? I for one could do without seeing their bones in a glass museum case. Let them rest.

MICHAEI. ABEL.
Midvale, Utah

## ZipUSA: Oak Bluffs, Massachusetts

What was the point of zip 02557? The article barely touched on the history behind the community. It held no substance other than to scream that Oak Bluffs is a place for rich, successful black Americans to hobnob with their own kind.

GEORGE C. NEMO
Hampton, Virginia

## Flashback

The photo of Faisal I was credited to Ernest B. Schoedsack. Readers might recognize his name from movie credits. After starting out as $\begin{aligned} & \text { feature-film cameraman, Schoedsack }\end{aligned}$ became a documentary filmmaker and then a director of action films, from The Most Dangerous Ciame to Dr. Cyclops. His crowning achievement, King Kong, holds up very well today.

MICHAEL REESE MUCH
Bethlchem, Penmsylvania

[^1]
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## HEALFH

## Polio's Last Mile

## India fights back after largest outbreak wh recent history

Polio was meant to be gone. By 2002. That's what health officials hoped would be the result of the Global Polio Wradication Iniliative, launched in 1988.

Although aggressive vaccination programs to protect children have cut an amual 350,000 polio cases. worldwide to fewer than 2,000 s- seven countries, the discase has
made 4 comeback, mainly in Nigeria, Pakistan, and India: Cases in India rose from 268 in 2001 to 1,600 in 2002,

How did this disease-that lo invading the spinal cord and brain can cause musele weakness and atrophy or in severe cases, permanent paralysis or deathreturn to India with such venigeance after near eradication?

A majority of Indias victims live in Uttar Pradesh, the eoumtry's most populous state and one at its poorest. People are crowded together, with open: sewers the norm. Such conditions faver transmission of the poliovirus, which lives and replicates in the intestines and spreads either from person to person or by ingestion of


A boy If Moradabad
gets al few drops of polio vaccine. Multiple national campaigns if 2003 have each targeted 165 million children as part of India's. push to eradicate the para: Iyzing disease ty 2005 .
anything that is contaminated with infected fecal material.

Another contributing factor: Nearly two-thirds of polio sufferers in Uttar Pradesh are Muslims. The fact that male health care workers cannot enter Muslim homes has complicated immunization efforts by the Indian government and other organizations helping in the fight to eradicate the disease: the World Health Organization (WHO), the U.S. Centers for Disease Control and Prevention (CDC), UNICEF, and Rotary International. "Muslim women aren't supposed to let male strangers into their homes," says Monique Petrofsky, a CDC nurse epidemiologist who accompanied an immunization team.

Repeated visits from health care workers also raise suspicions in Muslim communities distrustful of the Hindu-led government's motives. "All of a sudden workers show up with these drops, and people wonder: Is this birth control? Will this


INCAAN CHILD DISABLED BY POUO.


Bus itrely
KaREN KaSMAUSKI: BOTH]
make my child sterile?" says Bruce Aylward, WHO's coordinator for the Global Polio Eradication Initiative. Many parents refuse multiple vaccinations for their children, unaware that at least four doses are needed.

Still another cause of the upswing may have been overconfidence. With cases declining sharply, the Indian government in 2001 reduced mass immunizations everywhere, including in high-risk zones. In hindsight it was a tragic error.
But now the government has changed tactics, targeting the needs of the poor, including the country's Muslim minority. Trusted local schoolteachers, academics, doctors, and imams have joined immunization teams. Mosques announce vaccination days on the same loudspeakers used to call worshipers to prayer. And a woman is now included on nearly every team.

The hope is to eradicate polio from India-and from the Earth—by 2005. "We know villages and even specific blocks where children are not immunized," says a spokesman for the National Polio Surveillance Project in New Delhi. "We are closing in on this virus once and for all." -Bijal P. Trivedi

## Other Diseases We Can Eradicate

Only one human disease has ever been officially declared eradicated by world authorities: smallpox, in 1980. After polio, here are four that could fall.

Guinea worm The only other disease with a formal global eradication plan (estimated date: five years after war in Sudan ends). Affects 55,000 people in 13 African nations; 75 percent of cases are in southern Sudan. Eruption of worm from body causes debilitating pain.
Measles Kills some 800.000 children under the age of five annually in the developing world Rubella An estimated 100,000 babies are born blind, deaf, or mentally impaired each year as - result of maternal infection with rubella in early pregnancy.
Hepatitis B Believed to contribute to over 600,000 deaths annually. A challenging foe because many carriers are symptomless, yet still can spread the disease.

## WEBSITE EXCLUSIVE

Find links with more information about polio and other diseases at nationalgeo graphic.com/ngm/resources/0310.



# IL HATCHER 



## DRIVEN TO INNOVATE

PERFORMING AT TOP LEVEL in the face of white-knuckle conditions takes ingenuity and quick wits-familiar terrain for magazine photographer Bill Hatcher. Whether he's dangling upside down from ropes in a Grand Canyon cave or conquering the icy summit of Denali, Bill uses novel skill and an iron will to capture the world of extreme adventure. His astonishing photographs reveal such gravity-defying challenges, up-close and personal. He focuses his lens on the daunting thrills of rock climbing, mountain biking, river running, ice climbing and canyoneering...but never from the sidelines. Bill is an active participant in the adrenaline rush. His innovation with the camera and resourcefulness in the wild bring us to the center of the action.


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3. What drops down and swings out for casy. loading and unloading, making the Envoy MUV the only SUV with this feature?




CHKRSTIFPHEH WCODS

## ARCHITECTURE

## London's Other Underground

Below the city, a massive reservoir bares its bones

Inside it looks like a cathedral -but it's under a golf course and usually contains over 65 million gallons of water. Workers in London recently drained Honor Oak, one of Europe's largest underground reservoirs, for repairs, exposing the 94 -yearold Edwardian structure's brickwork, archways, and buttresses (above). Honor Oak opened in 1909 after three years of construction. The multi-section reservoir normally holds more water than 70 Olympic-size swimming pools.

It was emptied one section at a time to keep up service to southeast London.

- Laura Lewis


## More Buried Treasures

London's Mail Rail A 6.5-mile subterranean railway delivered mail across town from 1927 to May 2003.
WWII alr-raid shelters Eight deep shelters that could each sleep and feed 8,000 people were built after the Blitz. Today's use: archives and on phone exchange.


## MARINE BIOLOGY

## Found: Tiniest Horse in the Sea

Jtust six-tenths of an inch long Hippocampus denise, the smallest seahorse species yet discovered, was found on an Indonesian reef. Sara Lourie of McGill University and Project Seahorse searched for the pygmy seahorse after seeing a picture taken by nature photographer Denise Tackett. Says Sara, "We examined every little branch of coral for the telltale sign of an eye or a curled tail." -John L. Eliot

## LAST CALL

## Monster Cattish of the Mekong

This fish story is true. But the catch in question, the Mekong glant catfish, is fast dlisappearing. Up to ten feet long and weighing in at as much as 650 pounds, II ranks among the world's largest freshwater fish. Once abundant along a 500 -mile stretch of the Mekong River that winds through Myanmar (Burma), Thailand, Laos, and Cambodia, the behemoths are now vanishing, probably due to overfishing. In Thailand none have been caught for two years. But in Cambodia a fow are still netted, and It's there that biologist Zeb Hogan heads the Mekong Fish Conservation Project, supported by the National Geographic Society's Conservation Trust. Zeb pays local fishermen for thelr catch, hoping to find some catfish still allve (the one below had died). He tags live fish, then releases them. Among the information on the tag is his phone number, and fishermen netting tagged fish are urged to call. "We're trying to understand how the fish migrate and to do genetic studies on them," he says. "We also want to educate people about the importance of conserving them." -J.L.E


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from disk speed to data flow.

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A new inch-long hard disk drive made by Hitachi holds four gigzbytes of data-about a thousand times the drive capacity of a desktop computer 20 years ago. It's the latest in a family of hard drives built to store data in handheld devices from PDAs to digital cameras. The

3
hardest part of working small: Getting the actuator to move across the disk mere $2.500,000$ th of an inch from its surface.
-Michael Klesius

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## BIOLOGY

# It's All in the Genes 

## A DNA bar code can help scientists ID species

Imagine working as an agricultural inspector at an airport and finding an insect in a passenger's fruit basket: Is it foreign species that could damage crops? Problem is, depending on the bug, there might be only a handful of experts who could ID it-and you might have to mail the specimen to one of them.

Evolutionary biologist Paul Hebert of Canada's University of Guelph has proposed a system for using DNA to identify animals. Hebert wants to develop an electronic catalog of what he calls bar codes for all animal species, each code represented by a string of 645 A's, C's, G's, and T's-shorthand for the chemical subunits, or bases, that make up


AACACTGTA TCTATTATTTG art by bill sanderson

DNA. This 645-letter string is found in a specific gene that is common to all animals, yet the string varies from species to species.

If Hebert's idea is put into use, anybody with relatively cheap and portable DNA analysis equipment could identify almost any animal. Eventually, a new species could first be known
by its bar code. The Latin name could come later.

In a recent blind test of the system, Hebert received legs from 200 moth species. By grinding up each leg to obtain a DNA sample and analyze its bar code, he and his colleagues were able to ID each species-something a moth specialist would be hardpressed to do even with the luxury of whole animals to examine. (Many insects are identified by dissecting their abdomens to examine their sex organs.)

Bar coding wouk help biologists with another challenge: identifying a species with a complex life cycle when there is only an egg or a larva to work with. Many invertebrates, which account for more than 95 percent of all animal species, are only identifiable in their adult forms. Bar coding solves that because DNA's pattern is constant from day one to death.
-Hillel J. Hoffmann

## MARKETPLACE

## Gold That Swims

## The northern bluefin tuma

 (Thunnus thynnus) may be the most financially valuable wild animal on Earth.
## Value of one adult northem

 bluefin tuna: Often over $\$ 10,000$, although one prime specimen is reported to have sold for \$173,000.
## Weight of one adult northem

 bluefin tuna: Typically 250 to 300 pounds (world record is 1,496). Size of large tunas has decreased due to overfishing.
## How blueflins are bought:

Brokers usually buy tunas on New England docks directly from fishermen. The fish are immediately frozen, then shipped by air to Japan for auction in wholesale seafood

markets like Tokyo's giant Tsukiji market (above), the center of the tuna trade.
Price of one order (two thin slices) of bluefin sushi in a Tokyo restaurant: Around $\$ 100$.

Why is October 10 Tuna Day In Japan? Because the Japan Tuna cooperative says so. The date coincides with the writing of a poem about tuna published in an eighthcentury work named Manyoshu.


The Washable Seatle Suede Collection

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# SCENES 

AT THE NATIONAL GEOGRAPHIC SOCIETY


## Looking Through the Lens

National Geographic's largest photography book ever


Castration and branding may not be rituals familiar to all, but cowboys instantly recognize the scene above. "It's authentic to the rhythm of their lives," says photographer Sam Abell of the Montana image, one of 250 in Through the Lens: National Geographic's Greatest Photographs. The collection offers glimpses of
the kinds of moments that can only be captured "when photographers are in the field for a long time," says the book's editor, Leah Bendavid-Val. At 504 pages, it's the largest compilation of photos ever assembled by the Society. The book will be published in 20 languages and sells for $\$ 30$; find it online at shopng.com or wherever books are sold. A complementary exhibit will run through November 2 at the Society's headquarters in Washington, D.C.

NEW NG CHANNEL SERIES

## Animal Immersion

Simply watching animals' behavior isn't enough for veteran filmmakers Chris, left, and Martin Kratt. The brothers try to get inside the minds of animals in
their new series on the National Geographic Channel (Sundays at 8 p.m. ET/PT), Be the Creature. The Kratts hang with lemurs, run with wild dogs, even eat like bears-all to show what makes critters tick. The series debuts October 5.


MONICA MLKENNA

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LIBRAFO OF CONGRESS

## Battlegrounds

## A new look at geography's impact on war

Mountains are greater obstacles than rivers," Napoleon said. "One can always cross a river, but not a mountain." Like all great generals, he knew that the enemy in
most conflicts is terrain as much as it is the opposing army. A Pennsylvania rise-Little Round Top (above)-may have changed the course of the 1863 Battle of Gettysburg, and possibly of the
entire Civil War. In Batlegrounds: Geography and the History of Warfare (\$35), new from National Geographic Books, military writers re-tread the ground of some of the critical battles of the past, from Alexander the Great's victories to Norman Schwarzkopt's Desert Saber. Available at shopng.com or wherever books are sold.


## WILDLIFE AS CANON SEES IT

Which is stronger, the heart or the stomach? India's Manipur brow-antlered deer tested that question-with nearly fatal results. The graceful creature has always won hearts, with popular local legends prodaiming it a binding force between humans and nature. Yet poachers once pursued it so ravenously that by the mid-1900s it was believed to be extinct. A tiny population has since been found in the wild, and poachers no longer target this
much-loved symbol of Manipur's cultural heritage. With small numbers and a severely constrained habitat, however, the Manipur brow-antlered deer has not escaped the shadow of extinction.
As an active, committed global corporation, we join worldwide efforts to promote awareness of endangered species. Just one way we are working to make the world a better place - today and tomorrow.

NG TELEVISION E FILM SPECIAL ON PBS

## On the Road to Mecca

## TV crew documents Islam's holy pilgrimage

66 n Saudi Arabia it's really sunny in February, so many women carry umbrellas. But I couldn't do that and carry the microphone at the same time," says filmmaker Anisa Mehdi, explaining why her headgear wasn't exactly standard issue for a pilgrimage to Mecca (below). Anisa not only produced Inside Mecca, the National Geographic Television \& Film documentary exploring Islam's great pilgrimage; she also helped record its sound. Shadowing convert Fidelma O'Leary from her home in Texas to Mecca,

Anisa and her team joined more than two million Muslims on their trip to the holy city. Many pilgrims climbed the Mount of Mercy-where the Prophet Muhammad gave his last ser-mon-and made personal confessions to God. "The cameras captured people weeping out of sorrow for things they had done wrong." says Anisa. "They hold up their hands, in supplication, hoping God's mercy will rain down." The show airs on October 22 at $8 \mathrm{p} . \mathrm{m}$. ET/PT on PBS stations nationwide (check local listings).


SPECIAL EDITION POSTER

## Parallee Universe


"The only way to keep up with zebras is with a fourwheel drive," says Anup Shah, who with his brother. Manoj, photographed "Zebras: Born to Roam" in last month's issue of national Geographic. The magazine's latest poster pick is their photograph of mothers and foals trotting in the morning light in Kenya's Masai Mara National Reserve. Mothers keep their offspring closeand chase other zebras away-so foals learn to recognize mom's smell, sound, and stripes.

The poster wavallable for $\$ 39.95$ plus $\$ 6.95$ for shtipping i\$9.95 for international orders). Please add appropriate sales tax for orders sent to CA, DC. FL. KY, MI, PA, VA, VT: and Canada. We will produce ondy as many 24 -by 30 inch posters as we receive orders for by October 31, 2003. Each will be hanc-numbered and embossed with the Society seal. Shipping is scheduled for December 2003. Call toll free: 1-888-647-7301 loutside the U.S. and Canada call 1-515-362-3353) or order online at nationsigeographic.com/ngm.

## GET MORE

## SAUDI ARABIA (PAGE 2)

To leam more about a subject covered in this issue. try these National Geographic Society products and services. Call 1-888-225-5647 or $\log$ on to nationalgengraphic.com for more information.

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GEOGRAPHIC

EHadf: Journey of a Lifetime on the National Geographic Channel, October $9.8 \mathrm{p} . \mathrm{m}$. ET/PT. Follow three Muslims from Britain-a young Egyptian woman, an Asian father traveling with his son, and a Western convert-as they make the pilgrimage to Mecca, Islam's holy city.
Cradle and Crucible: History and Falth in the Middle East. Photos and essays on the cultural, political, and religious forces that have shaped the region since prehistoric times (\$30).

- National Geographic Atlas of the Middle East. Detailed maps of 16 nations, the West Bank, and the Gaza Strip, plus information on oil, water, religions, and more ( $\$ 19.95$ softcover; members-only hardcover edition available for \$24.95. Call 1-888-647-6733).


# Who Knew? 

## CELIULAR JMAGING

# The Glow-in-theDark Brain 

## Brought to you by a jellyfish

Shelley Halpain makes bright, vivid movies of brain cells growing, and here's what she sees:
At first a brain cell looks like a fried egg. It quivers, then sends out tendrils. The tendrils wriggle, extend, and then retract, an out-and-back motion that Halpain describes as saltatory. You might just say they're salsa dancing.

One tendril becomes an axon, a conduit for transmitting signals to other brain cells. Axons explore their terrain intrepidly, hoping to link up with other cells. The rest of the tendrils become dendrites; they stay near home, waiting to spark a relationship with any axon that might come wandering by.

Halpain, a neuroscientist at the Scripps Research Institute in San Diego, wants to figure out how a tendril knows to become an axon instead of a dendrite. What compels the brain to organize itself in such a fashion? Who's driving the bus?

These questions will likely take years of research to answer. In the meantime Halpain's movies take advantage of a tool that radically improves her ability to see brain cells developing in real time. It's a fluorescent protein from a jellyfish.

For years scientists had struggled to see how brain cells grow. Researchers had been chemically attaching fluorescent molecules to proteins,
then injecting the concoctions into a cell, but this laborious process often killed the cell before experiments could even begin.

Then came Aequorea victoria, a glowing jellyfish that lives in the North Pacific. Scientists were able to isolate a fluorescent protein in Aequorea, and using their collective genius, they came up with a name for it: green fluorescent protein.

GFP, as it's more commonly called, is barrel-shaped and hollow in the center. Right smack in the middle is the fluorophore-the glowing part of the protein. (Did we say barrel? It's really a lantern.)

By 1995 researchers had figured out how to clone the gene that produces the protein and had developed a technique for stuccessfully transferring the gene into brain cells so that they, too, would become intrinsically fluorescent.
The gene is now manufactured in test tubes using bacterial cultures, and no jellyfish need be sacrificed on behalf of neuroscience.
No doubt people will continue to find creative and slightly weird uses for the protein lantern. Someone had the bright idea of genetically engineering a mouse that produces GFP throughout its body. Under certain lighting these mice glow faintly green. (You can see where this will lead. Coming soon to a mall near you: roving packs of fluorescent green teenagers.)

Even Hollywood has found clever ways to use GFP. Did you see the cameo by Aequorea at the beginning of Hulk? Now we know the Hulk's true color: jellyfish green.
--Ioel Achenbach
washimgton post staff waiter

## IT MATTERS

th's not easy coming up with a list of good thingsa about Jellyfish.
Swimmers hate them because they
can ruin a day at the beach; fishermen hate them because they clog their nets. But jellyfish provide us with more than just glowing proteins for lab experiments. To those living around the northern Pacific Rim-in Japan, Russia, Alaska, and Canada-Jellyfish matter because they're a major item on the daily menu of chum salmon. Chum have really big guts to handle their jellyheavy diets, and though they may not be as famous as their Atlantic or sockeye kin, chum salmon account for more than a third of the world's wild salmon catch. It's a food chain thing: More jellyfish for hungry salmon equals more salmon for hungry humans. -Hillel J. Hoffmann

## WESSITE EXCLUSIVE

Learn more about Aequorea and other jellyfish-and find links to Joel Achenbach's work-at nationalgeographic .com/ngm/resources/0310.


# KINGDOM ON EDGE 



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Sharing añ apartment in leddah, these laborers are among more than six million guest workersore quarter of Saudi Arabia's populationfrom Yemen, Pakistan, and beyond. They do the jobs that many Saudt rent raised in ath era of thsy oil money, avoid betuse the work $=$ either too menial or too technically demanding. Such attitudes fuel an unemployment rate among young Saudis ranging as high as 30 percent.

## all employees in the kingdom's private sector.





On the Plain of Arafat, near Namira mosque (above), the Prophet Muhammad delivered his last sermon in 632: "No ... apostle will come after me, and no new faith will be born." This revelation still anchors Saudi Arabia, Islam's historic epicenter.

Ahigh noon, the streets of central Jeddah are empty, silent, vacant of all but the occasional lonely passerby to remind me that more than two million people live in the apartment towers and neighborhoods that radiate out from the shores of the Red Sea. This is the second largest city in the Kingdom of Saudi Arabia, its commercial engine and busiest port, its most cosmopolitan metropolis. But now, during the holy month of Ramadan, every sensual pleasureincluding eating and drinking-is banned from dawn to dusk, and Saudis stay indoors to pray and fast, or to catch a nap in the cool, dark recesses of their homes. For hours each day, there are no signs of life outdoors, no stirring but a breeze, no movement but heat waves shimmering over asphalt in the broiling Arabian sun.

Nights are a different matter.
As soon as the sun drops below the horizon, urban Saudi Arabia emerges with in sleepy yawn, then flings itself into a frenzy of socializing, shopping, and gargantuan feats of dining. During the holy month, it's hard to find an a la carte menu in the restaurants of Jeddah; the all-night, all-you-can-eat Ramadan buffet is the norm, at
tables groaning under 24 -ounce steaks, mountainous platters of lobster, and roasted 30 -pound quarters of mutton.

At 3 a.m. miles of freeways and boulevards are locked in a traffic jam of gas-guzzling, mostly American, cars headed for shopping malls that remain open until sunup. Macho sport utility vehicles are the ride of choice among affluent young men, Lincolns and Chevys among their parents. In the malls, store aisles throb with music videos blasting out techno and rap as salesmen hawk subscriptions to satellite television-technically illegal in Saudi Arabiawith a success rate that has made satellite dishes ubiquitous on the rooftops of Saudi cities. If not for the neon signs in Arabic, the streets of Jeddah tonight could pass for downtown Los Angeles or Dallas or Houston.

Up and down chic Tahliyah Street, carloads of teenage boys, with baseball caps worn rakishly backward and their ankle-length robes tossed aside in favor of baggy, low-slung pants, idle alongside cars full of teenage girls driven by chauffeurs.

As I take in the scene with "Hassan" (not his real name), my 18 -year-old guide, a green Chevy slowly passes a silver Jeep Cherokee, and a
blizzard of paper flies between their vehicles.
"What was that all about?" I ask.
"They're 'numbering," Hassan explains. "A girl writes her cell phone number on a piece of paper, rolls it into a ball, and throws it at a boy. Then she waits for all."

But the flirting, with its paper-wad blizzards and cell phone dates, has a distinctive Saudi twist: The girls are still covered from head-tofoot in the black gown known as the abaya, their faces hidden behind veils.
"Otherwise the mutawaeen might go after them," Hassan says, referring to the state religious police, the agents of a theocratic law-andorder system that dates back more than a thousand years.

Jeddah, in the middle of the night, is the paradox of contemporary Saudi Arabia writ large. "We are being carried in two directions at once, backward and forward," says Suad al-Yamani, a Saudi neurologist who sees, in her patients, the disorienting effects of changes that have rocketed a deeply conservative society from the 7 th to the 21 st century in the span of a few decades.

The stakes are beyond exaggeration, for Saudi Arabia is not simply another traditional country coping with change. As keeper of the Muslim holy cities, Mecca and Medina, it serves as the chief custodian of Islam and the spiritual home of 1.3 billion Muslims worldwide.

Ruled by a tribal monarchy and governed by sharia, or Islamic law, Saudi Arabia is a major ally of the United States and the source of 25 percent of the world's confirmed oil reserves, which has made its royal family extraordinarily affluent, influential, and resented.

It is also the birthplace of Osama bin Laden and 15 of the September 11 hijackers-a nation accused of fomenting terrorism, yet itself haunted by the menace of bin Laden's al Qaeda movement and terrorist attacks such as the bombings in the capital, Riyadh, five months ago that killed 34 people, Saudis and foreigners alike.

Today Saudi Arabia is at the center of a cultural and geopolitical maelstrom, where Islam meets the modern world, where tribal custom meets cell phone consumerism, where fabulous wealth meets uncertainty and alienation. What happens to the oil-rich Saudis, as they wrestle with their own dire confusions in the heartland of Islam, sends tremors all over the Earth.

This is what brought me to Arabia, and why, one winter morning, I found myself in a car climbing east with two Saudi companions into the province of Al Bahah, one of the kingdom's most obscure regions, a land of amorphous towns and barren ridges that was home to several of the September 11 hijackers.

The mountain road inland from the Red Sea was a serpentine gauntlet of police checkpoints, three in a single 12 -mile stretch. As we reached the city of Al Bahah, the provincial capital, the thickest fog I'd ever seen closed in, and we could barely spot the last few roadblocks, manned by Bedouin policemen dancing from foot to foot in an effort to keep warm. The fog never lifted, and, apart from government officials, the cops were among the few Saudis out in public. Al Bahah was a surrealistic cityscape where cafés and restaurants were manned by Afghan cooks, barbers and mechanics were Indians and Turks, and taxis were driven by Pakistanis or Egyptians.
"Saudis don't like it here, sir," a cabbie from Peshawar told me. "Too wet and cold, and there is no work that suits them."

The government puts the number of guest workers in Saudi Arabia at more than six million-nearly half the kingdom's working-age population. Their ranks include an elite class of physicians, engineers, scientific researchers, and corporate managers, who are provided with luxurious housing, stratospheric salaries, and annual two-month paid vacations from their jobs in cities such as Riyadh, Jeddah, and Dhahran.

Places like Al Bahah, however, are the realm of thousands of Third World guest workers, an inexhaustible pool of truck drivers and factory hands, manual laborers and domestics, shop clerks and secretaries, who welcome the jobs that many young Saudis don't want.

Bored young people with too much time on their hands: This is what the Saudis themselves regard as their seminal crisis, sown in the clash between borrowed modernization and threatened traditions-the root crisis from which a forest of others has sprung.
"The hijackers were a direct product of our social failures-a generation with no sense of what work entails, raised in a system that operated as a welfare state," a high-ranking

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## Islam's animating principle is a direct

government official told me. "We allowed them to grow up in pampered emptiness, until they turned to the bin Laden extremists in an effort to find themselves."

Saudis claim that al Qaeda deliberately fills its ranks with the kingdom's alienated young. Bin Laden's goal, they believe, is to topple the Saudi royal family, partly by convincing the West that its principal source of oil is fatally infected with extremism.
"We are not a nation of terrorists and fanatics. You cannot blame an entire people for a crime perpetrated by a small number of marginal individuals," contended Prince Salman bin Abdul Aziz, the governor of Riyadh.
"The crazies around my age, the people who say, 'We should go out and kill Americans,' are maybe one or two percent of us," said "Mustafa," a 22-year-old I met during my tour of Jeddah's Ramadan nightlife.

But Mustafa, like so many in his age group, has no job and no discernible ambition. Estimates of unemployment among Saudis top 15 percent, and approach 30 percent among those between ages 20 and 24. Each year about 340,000 Saudi men enter the workforce, vying for just 175,000 jobs. The unsuccessful drift into an ever growing army of the bored, spending their days and nights in the prolonged adolescence of the shopping mall circuit, numbering and street cruising.


The way of Islam colors every detail of life in the kingdom, where tones of devotion echo from mosque to public square, and the Koran is the law of the land. Birthplace of the Prophet Muhammad, Saudi Arabia walks the narrow path set down by 18 th century reformer Muhammad ibn Abd al-Wahhab, whose stern dictates regarding infidels, women, conversion, and righteousness still grip the kingdom today.
could go straight from school to an executive suite. "They imagined that it would be a society of all chiefs and no Indians," Prince Alwaleed bin Talal, a leading real estate developer and entrepreneur, told the Arab News last year.

Now, say economists, something has to give, starting with an educational system that fails to meet the demands of modern industry. "The companies who come to us are looking for skilled workers, business grads, engineers, and technicians," said Nasser Salih al-Homoud, director of an unemployment office in Buraydah, a quiet farming center of 350,000 in central Saudi Arabia. Few Saudis qualify.

One of his clients is Abdulrahman al-Ali, 25. "I've been trying to find a job for a year," he told me. "When I submit an application, people tell me they'll call, but they never do." The problem is his schooling: Like many young Saudis, al-Ali has a bachelor's degree in Islamic philosophy.

The fulcrum of Saudi history can be pinpointed exactly: the Persian Gulf city of Dammam on March 3, 1938, when American engineers unleashed the kingdom's first commercially viable oil gusher after 15 months of drilling. The joint venture between U.S. petroleum companies and Saudi Arabia's ruler, King Abdul Aziz ibn Saud, put the fledgling nation on the global economic map.

Ibn Saud had launched his conquest of Arabia three decades earlier. Initially he led just a few dozen men against the ruling AI Rasheed clan, who had driven the rival Sauds into exile

## relationship between believers and God.

The solution would seem obvious: Replace foreign workers with Saudis. Under a policy known as Saudization, the government has been trying to do exactly that since the mid-1980s. The state grants large interest-free loans to any citizen who wants to establish a private business, and offers salaries to students willing to undertake vocational training. The goal is to replace 60 percent of the foreign workers with Saudi nationals, in jobs ranging from taxi driver to administrative manager. But two decades into the policy, foreigners still make up more than 90 percent of all employees in the kingdom's private sector.

Until recently, every young Saudi thought he
in 1891 and seized control of Nadj, the area surrounding the caravan crossroads of Riyadh, and the Al Qasim region to its north. The Al Rasheeds were allied with the Turkish Ottoman Empire, which then governed the Red Sea coast, including Jeddah, Mecca, and Medina, while the Sauds were buoyed by alliances of their own. One was with followers of Muhammad ibn Abd al-Wahhab, the charismatic 18th-century religious reformer whose fervor helped propel the Sauds to power and defined their view of Islam and the world. The other was with Britain, whose support during and after the fall of the Ottoman Empire in World War I made the Saudi state possible.



During the first three decades of the 20th century, Ibn Saud's forces and territory steadily grew as he combined brilliant military campaigns with adept diplomacy-and strategic marriage pacts with other tribes-to expand his realm to its present borders.

In 1933, a year after Saudi Arabia was founded with Riyadh as its capital, Ibn Saud granted an exclusive oil exploration concession to the Standard Oil Company of California. The partnership evolved into Saudi Aramco, the government-controlled enterprise that now presides over some 260 billion barrels of oil reserves and 225 trillion cubic feet of natural gas-and accounts for about three-quarters of the kingdom's revenue. This vast wealth has funded the Arab world's most modern and well-equipped military force, a monumental welfare system, a network of religious missionaries dispersed throughout the Muslim world, and spectacular royal residences in Beverly Hills, London, and the south of France.

From the moment the oil concession was granted, "modern" in Saudi Arabia came to mean American modern-and more precisely, the outsize, mass-consumer version of modern that American oilmen carried with them from the U.S. Southwest, primarily Texas. Even apart from oil, the fit was in some ways natural. Like Texas, Saudi Arabia juxtaposes a long humid sea coast and a huge arid interior scorched by extreme desert temperatures. Between its 1,600 miles of Red Sea and Persian Gulf beaches lie 865,000 square miles of flat desert plains and mountains, more than three times the size of Texas itself and two and a half times the combined size of Germany and France.

It would be impossible to exaggerate the shock waves that the discovery of oil sent through this landscape-and the life of its inhabitants. 'l'he Arabian Peninsula has seen more change in the past six decades than in the previous 13 centuries. As recently as 1950, Riyadh was a sleepy oasis town of 60,000 inhabitants, most of them still living in mud-brick houses. Then came the 1970 s oil boom, and with it a construction binge unlike anything the Middle East had ever seen. In the estimate of its harried Urban Development Authority officials, Riyadh now houses four and a half million people, and is well on the way to becoming an Arabian megalopolis.

THE WORK OF GOD ELEPHANT ROCK AT MADAN SALIE




THE CURRENTS OF CHANCD MAKING WAYPSON THE REDSEA COAST

But Texas-style gigantism doesn't end there. A modest house in the Riyadh scheme of things - "where normal people live," as an Urban Development official put it-measures 5,000 square feet, roughly five times the size of a middle-class home in Western Europe and palatial even by Texas standards. Far larger residences are by no means unusual. "I'd like to show you my new house," a mid-level government bureaucrat told me one day in Riyadh. "The construction is almost finished." When we arrived, I mistook it for an apartment complex; it covered more than 25,000 square feet, spread across half a dozen buildings lined from ceiling to floor in imported rose marble.

The Saudis claim that they need the space-in part because up to four generations customarily

inhabit the same home, and because of the sky-high fertility rate. The kingdom's estimated population has ballooned from 6.2 million in 1970 to 24 million in 2003, one of the steepest increases on Earth. The average Saudi woman bears more than six children.

They are born to a society forged in the austere universe of the desert, governed by a single family and grown overnight into a network of awkward 21st-century cities. It's a society that can seem mute from a distance-across the gulf of ignorance and caricature that envelops Western views of the kingdom-or at best speaks only in the official voice of an autocratic state.

Closer up, I found, Saudi Arabia is a babel of contentious opinion, even in its most remote desert encampments.

The wilderness reserve of Uruq Bani Maarid lies 320 miles south of Riyadh, in the shelter of towering dunes that mark the western perimeter of the Rub al Khali, the Empty Quarter, the enormous desert the Bedouin know simply as the Sands. But it's not empty for the Yam tribesmen who live there. Since time immemorial they have crossed the Sands' 225,000 -square-mile desert in search of water and forage for their camels and sheep.

Zafer al-Fahd was raised in one of the black Yam tents that was pitched near a ranger post the week I traveled to the Empty Quarter. At 27 he had never experienced the contradictions of Ramadan in urban Saudi Arabia and said that he had no desire to. "The Sands are enough for any man," he told me.

It was just past dawn. As Zafer built a fire in the entrance to the tent to stave off the morning chill and make breakfast, teenage boys hammered out a drum rhythm in brass mortars, grinding down coffee beans.
"My heart is at rest in the Sands," he continued. "I know how to read the desert winds when I graze my animals. I know how to find my way through the dunes at night by keeping al-Jedi before me: That one, the 'goat star,' he said, pointing into the northern sky.

There are no reliable statistics on how many Bedouin are fully nomadic today. (Saudis acknowledge that their country's mirage-like census is a demographer's Empty Quarter.)

The sweet scent of burning sandalwood perfumes the desert air for a Bedouin near the border with Iraq, where tribal leaders meet at the tent of a prominent sheikh to share a campfire, break bread, swap stories, and debate news of the day.


## "What matters most to us are your ancestors.

A half-century ago, the best guess was that 30 percent of the population, about two million people, lived the desert wanderer's life. In the estimate of Saudi ethnologist Ali al-Ambar, the figure has dropped to roughly 600,000 .

A far greater number have become what alAmbar refers to as "semi-nomads" herding their flocks on the outer economic orbit of mushrooming cities, or "urbanized" Bedouin who work city jobs but retain ancestral tribal customs. Taken together, these three communities still make up more than half Saudi Arabia's total population and a large share of its self-image. Despite the kingdom's precipitous urbanization, the free-ranging spirit of Bedouin culture
remains at the core of traditional Saudi identity.
Slowly, other men drifted into the tent where I sat with Zafer. They gathered in halaqah, small conversational groups, relaxing on pillows around the tent's margins. The talk was of hunting and camel-raising, and, when I brought the subject up, the essential values of the Bedouin.
"What matters most to us are your ancestors, who they were," one man said. "Without a tribe, a person is suspect."

The elder seated next to him took immediate issue. "No, I don't agree. The important thing is what you yourself do in this world, not who your grandparents were. It is you who must choose between good and evil."


## Without a tribe, a person is suspect."

I heard echoes of that conversation everywhere I went in the kingdom, traveling through 11 of its 13 provinces over a four-month period from Ramadan to the hajj. The echoes spoke of a peculiarly Saudi version of democracy with its roots in the desert, an incessant and openended debate that resounds throughout the larger society.
"The first thing any Saudi does when he builds a new home, even in a big city," al-Ambar had said to me, "is to put a tent in the garden, or a figurative version of it in the house."

Those figurative tents were of a piece architecturally: large rooms lined with chairs and sofas; the institution they serve is the majlis, a social
gathering for the purpose of conversation and counsel. A majlis may also amount to an official audience, especially if its host is powerful.

His Royal Highness Abdullah bin Abdul Aziz al-Saud, Crown Prince, Regent, First Deputy Prime Minister and Commander of Saudi Arabia's National Guard, is distinctly powerful. He is effectively the acting monarch, in place of his ailing half brother King Fahd, who suffered a debilitating stroke in 1995. One morning I attended his weekly majlis with Majed al-Jarralah, 30, and Riyadh bin Salmah, 25 , Saudi friends who were my companions on


remains at the core of Saudi identity.


## Saudis claim that al Qaeda deliberately fills

the journey across their kingdom.
With al Qaeda thought to be preparing new attacks, security was heavy at the entrance to the crown prince's wing at National Guard headquarters. Yet inside, notwithstanding the splendor of a majlis hall that measured well over a thousand square feet and was furnished in the style of a Louis XIV salon, the casual pattern borrowed from the desert was unmistakable.

We watched an elderly man, with the leathery weathered skin of a desert herdsman, as he approached Abdullah. They shook hands, and the herdsman sat down next to his nation's ruler to discuss a problem man-to-man, patting the crown prince on the arm from time to time to emphasize key points.
"He may be asking permission to graze his sheep on royal land," one bystander whispered in my ear as we discreetly tried to eavesdrop. "Some people just drop in to say hello," Riyadh added. "Or even to ask his opinion on their marriage problems."

No preliminary interviews are conducted before the royal audiences, which are held by every princely official in the nation. Anyone is free to attend, and it's not unusual for a Bedouin
camel herder with grazing complaints to precede a billionaire property baron who needs a construction permit. In both cases, the prince listens attentively and then assigns the matter to one of the aides who stand beside him during the majlis.

Beyond the palace walls, the range of such meetings is endless. Some are neighborbood meetings aimed at sorting out local disputes. At others, intellectuals and writers meet businessmen and engineers, or bureaucrats compare notes on the problems of government with their retired predecessors.

As at the royal majlis, the resonance with the tents of the Bedouin past is inescapable. Men wander in at the end of the day, shake hands all around, then join conversation circles over cups of brain-charging Arabic colfee, sugary dates, and heavily sweetened ginger tea.

At one majlis, I asked a noted Muslim scholar, an imam, how Islam's venerable assertion of religious tolerance could be reconciled with Saudi Arabia's ban on Christian churches in the kingdom.
"It was the command of God, conveyed to us through the Prophet Muhammad, that no other


## its ranks with the kingdom's alienated young.

To defend their homeland, Saudis rely on imported weapons - from guns brandished by a security detail (opposite) to jet trainers like one on display at a festival (above). But many Muslims resent having foreign soldiers stationed on Saudi soil, which prompted the United States to redeploy part of its force to neighboring Qatar earlier this year.
religion be permitted in the land where Islam was born," the imam replied.

To my surprise, another guest picked a point-for-point argument with him. "I've heard that allusion a hundred times, and nobody has ever convinced me that this is what the Prophet's words really meant," he said.

It is in these gatherings that competing visions for the kingdom's future are being imagined and discussed. In their updated Bedouin encampments, the Saudis are negotiating their own way through a perilous landscape, where old assumptions are being challenged along ancient roads in the birthplace of Istam.

From a passenger plane descending into Medina under a full January moon, the Prophet's Mosque was a dazzling rectangle of white light, pulsating several thousand feet below at the city's heart. An hour later I was under its minarets, walking slowly
across a vast square of polished marble in sight of the tomb of Muhammad, which is what makes Medina the second holiest site in the Islantic world, after Mecca.

Majed and Riyadh and I had driven into Medina from the airstrip, until we reached an area several blocks from the city center that was flooded with people making their way toward the mosque. We parked the car and joined them.

The first days of the hajj, the annual pilgrimage that marks a lifetime's spiritual goal for Muslims and draws more than two million people each year to Mecca and Medina, were upon us.

Many of the pilgrims around me were Saudis and Arabs from the Persian Gulf. But among them were throngs of Indonesians and Malays, Algerians and Moroccans, Senegalese and Nigerians, Somalis, Uzbeks, Pakistanis and Bangladeshis, Turks with red crescent-moon flags embroidered on their shirts, Chinese in yellow

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ail field shine filr, jewels in tile crown © Saudi Arabia, which controls one-fourth fif the Earth's known unvivaled ability fe quickly increase or dlcrease top world!s supply af energy has made tha kingdom a prized ey for $1=$ U.S. and other Werterus mations, when interent in Souds polith eal stabllity gees well bencath the curfien
create a genuinely modern society."


## "We are being carried in two directions

windbreakers stamped with the logos of Xinjiang travel agencies.

There were as many women as men in that crowd, marching forward to the Prophet's tomb in the great egalitarian pageant that is Muhammad's chief legacy. Islam is a religion without an institutionalized church, without a Vatican, without a formal priesthood; its animating principle is a direct relationship between believers and God, a personal relationship that transcends race, class, and gender.

The faces around me were a study in raptured meditation, and in the immense silence that enveloped the Prophet's Mosque, I fell into a reflective trance of my own. Then Riyadh, whose father is an official of the haji, gently touched my arm. "Now, my friend," he asked. "Do you understand?"

Riyadh's question was a central theme of my quest in his country: trying to understand the coexistence of Islam's rich worldwide diversity-its private song to God in 1.3 billion voices-and the monotone religious orthodoxy that prevails in the kingdom itself.

Most Saudi interpretations of Islam in 2003 still sound the puritanical chord struck over
two centuries ago by Muhammad ibn Abd al-Wahhab, the religious reformer whose alliance with the Saud clan bestowed religious legitimacy on the Sauds and enormous political power on Wahhab's followers.

Today, in mosques all over the country and in Saudi-funded religious schools throughout the Muslim world, clerics advocate Wahhab's stern program, which is based on a return to the "pure" Islam practiced during the Prophet's time. Its spirit is at fierce odds with the consumerism that has erupted in Saudi Arabia since oil was discovered, and-fundamentalists charge - with the lavish lifestyles of the Saudi royal family.

Though public criticism of the monarchy is rare, some clerics do speak out on political topics in voices that can veer toward the fanatical. More common are the virulently antiWestern sermons that bolster Osama bin Laden's portrait of an Islamic holy land surrendered to foreign corruption.

aught in the crossfire are the vast majority of Saudis, and none more vulnerably than the kingdom's women. Wafa M. is a 26 -year-old science


## at once, backward and forward."


#### Abstract

Mesbah Hejazi struggles with disabling arthritis, diabetes, epilepsy, and poverty, but she doesn't struggle alone: The government pays a doctor to make house calls (above), part of national health care that's free for all Saudis, rich or poor. Relaxing in leddah (opposite), the Naqshabandi family can focus more on news about the war next door.


teacher so devoted to her profession that she makes a 200 -mile round-trip five times a week from Jeddah to a rural high school near Medina that would have no biology department without her. That alone puts her on the leading edge of change in a society where half of all women were illiterate as recently as the mid-1990s.

By law, however, she can't drive a car; she's ferried to the school in a chauffeured minivan with four other female teachers. She cannot walk the streets of her city unveiled or unchaperoned without risking confrontation with the mutawaeen. She cannot travel abroad without a mahram, a male guardian from her immediate family.

Like the overwhelming presence of foreign workers in the kingdon's streets, the overwhelming absence of women in public can be jarring to outsiders, no matter how prepared they are to encounter Saudi misogyny. It is as though the traveler enters a half-populated landscape, in which 50 percent of the human race has been relegated
to faceless shadows that flit discreetly along the margins of activity, or black-veiled wraiths who toss numbered paper wads to teenage boys in hope of a disembodied flirtation by cell phone.

The chief enforcer of constraints on Saudi women, in the simple caricature of Saudi society, is the domineering husband, a staunch ally of the religious police who stalk the streets in search of "immodest" women.

But real life is seldom so simple: It was Wafa's husband, Saad, who organized my surreptitious meeting with his wife in a Starbucks café, encouraging her to remove her veil and allow this article's photographer, Reza, to take her photo.
"I just can't do it," Wafa finally said. Reza left, and the veil remained in place throughout our two-hour conversation over caffe latte, as the couple's five-month-old daughter, Lana, gurgled happily in her mother's lap and her two-yearold sister, Dina, squirmed for attention.

Wafa tried to explain. (Continued on page 32)


Arabian horses once galloped across an Islamic empire, marked by wealth and culture, that stretched from Spain to western China. Today in Saudi Arabia, the breed: occupies a smaller stage -at racetracks, eques-1 trian events ${ }_{y}$ and stud: farms like the one owned by Prince Sultan bin Abdul Aziz. By preset $=$ ing the bloodline of arial bians, Saudis sustain a symbol of an earlier: golden age.
 and traditionis

the root crisis from whigh others have sprung.
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"We are rithemation of terrorists and feeling not uncommon among Saudis these days -touches the face of a fisherman on the Red Sea: With labor force far better trained in theology than engineering, Saudi Arabia teems with unemployed young people who still expect oil money to keep them comfortable. As a result, says Saudi journalist Mohammed al-Khereiji, "a lot of young Saudis sit around doing nothing."


## Subversive counterinfluences are as

(Continued from page 27) "It's not only a religious issue for me, and not even a civil liberties issue," she said quietly. "It's about our families, about what they'd say and think if someone saw me in your magazine. Things like that just aren't done."

A day earlier, Saad had briefly talked her into the photo. He's a convincing guy, a 27 -yearold public relations and advertising man, partly raised in the United States, who picked me up at my hotel wearing $\tan$ chinos and a buttondown oxford shirt. But he's not as convincing as Wafa's parents, who had changed her mind the previous evening in a meeting at their home in Mecca.
"The pressure to observe the old ways is exerted most powerfully at the level of the family," notes Prince Abdullah bin Faisal bin Turki, a prominent spokesman for modernization. "To criticize those ways is to criticize your own parents and grandparents."

Yet the old ways themselves were considerably looser quarter century ago, before the Iranian Islamic revolution in 1979 pushed the entire Middle East toward more repressive social norms. Many Saudis on the Red Sea coast, where desert
custom is tempered by trade and the constant passage of foreign Muslims on the pilgrimage to Mecca and Medina, also blame the rise of Riyadh, which overtook mercantile Jeddah as the nation's most important city in the 1970s. The capital is a chief stronghold of Wahhabism, the seat of the Committee for the Propagation of Virtue and the Prevention of Vice, also known as the mutawaeen, and of the powerful Ministry of Religious Affairs.

Subversive counterinfluences, however, are as close at hand as satellite television. To the daughters of traditional Arabia who sit glued each afternoon to uninhibited and wildly popular soap operas transmitted from Beirut and Cairo, the message is that women can be good Muslims and serve as government ministers; they can dress as they like, drive their own cars, and run their own businesses. They can dream. Which is one of the main reasons Wafa subjects herself to a $1,000-$ mile commute every week.
"The girls I teach are the daughters of peasant farmers," she said. "I'm their window to a larger world. What I want for them, what i want for my own daughters, is the possibility to act on their dreams."


## close at hand as satellite television.

Students at Dar Al-Hekma, a women's college in Jeddah, can study nursing, management, and graphic design (above), but because of Saudi interpretations of sharia, or Islamic law, they cannot travel abroad without permission, appear in public unescorted, or drive a car. Men at a café in Al Khubar (opposite) idle on a very different road.

A$t$ a suburban estate north of the capital, 1 arrived before a p.m. for dinner and wound up in a conversation that proceeded, with great intensity, until I finally left for my hotel at $5 \mathrm{a} . \mathrm{m}$.
"We have a village mentality, closed and fearful, even though most of us now live in cities," my host said at one point, trying to account for the walls built around his nation's women.
"We Saudis should have used our oil wealth to create a genuinely modern society, to promote real development," I was told in another sitting room, this time in downtown Riyadh. "Instead, we went on a five-star tourist trip, and now we're seeing the consequences."

Both men are royals in their 50 s , and one is near the pinnacle of a very long line of succession emanating from Ibn Saud, who personally led the great Saudi baby boom, unifying his realm by fathering children with the daughters of as many tribal leaders as possible. Seventy
years after he founded the kingdom, the House of Saud counts more than 5,000 princes.

Hundreds of the royals attended universities in Europe and North America 30 years ago. When you visit their homes and discussion turns nostalgic, they are likely to dig out a Jefferson Airplane or Beatles album and put it on the stereo. Their mentality is a complex mixture of deep attachment to the traditional Arab values personified by the Saud family, and a thoroughly international outlook imparted by educations abroad during the 1960s and 1970s. Pulled, even more than their subjects, in two directions at once, their sense of crisis is acute.
"What happens here in the next five to fifteen years will be crucial," said Prince Faisal bin Abdullah, who invited me out for an evening's talk during Ramadan. We sat in his garden on the Red Sea shore north of Jeddah, sipping tea and snacking on pistachios and cashew nuts.

Faisal's official role is an administrative post

discreetly along the margins of activity.
in the National Guard, but his deeper ambition is to establish a network of think tanks for Saudi Arabia, modeled on those he encountered as a student at Stanford. He believes that only professional, scientific governance-in a word, technocracy-can thread a rational course between the dangers of both religious fanaticism and mindless mass consumption.

Many in the rising generation of leaders share this conclusion; in recent years they have energetically promoted the careers of skilled technocrats on their own staffs and throughout the bureaucracy. The flagship of their vision is the Majlis ash-Shura, a consultative assembly created by King Fahd in 1992 and installed in an

Despite the Che Guevara T-shirt (below), no socialist revolt is brewing. But anger is. Enraged by U.S. Mideast policy, some Saudis boycott U.S. brands like Coke, which markets Western tastes on the sidewalks of Mecca (right).


## Saudi Arabia is in a cultural maelstrom, where

enormous domed hall on the grounds of the Royal Palace in Riyadh. The Shura is arguably the most educated government assembly ever to exist. Of its 120 members, 77 hold doctorates or medical degrees; 87 are graduates of major Western universities. Remarkably for Saudi Arabia, only 12 hold degrees in religious studies.

Although the Shura's members are now appointed by the King, some observers regard it as the forerunner of an elected legislature that will eventually share power with the monarchy. Not everyone agrees with that premise. But on one matter there is near unanimous agreement across the kingdom. Whoever leads Saudi Arabia, his most pressing task is to create an authentically

Saudi definition of progress to replace those simply borrowed or bought from someplace else.

The central square of Sabya, a farming town in the kingdom's rural south, was swarming with worshipers before Friday prayers when Jabbar Abdulghani bin Isa stepped from the rear of a police van. He expected it to be his final hour on Earth.
"Up ahead, just a hundred meters away beyond the mosque, I could see the executioner," he recalled. "I could see his sword glinting in the sun."

From the square's far side, Muhammad Banaygh watched. He had been waiting 17 years


## tribalism meets cell phone consumerism.

for this moment, since the day that his father was killed in a fight with bin Isa.
"All of those years, my family had wanted his blood," he said, as we talked later in a hotel coffee shop. But as the crowd parted and his father's killer was led to the execution block, Banaygh suddenly decided that the shedding of more blood would solve nothing.
"I turned to my brother and my uncle and said, 'Let's stop it.' " They waved frantically to the officials in charge.

Sitting across the table from Banaygh and me in the coffee shop, the condemned man, bin Isa, described the next moments with the vividness of someone who had stared into the abyss of his
own death. "The crowd started clapping and one of my guards kissed me on the forehead. 'Praise God,' he said, 'it is His will that they have forgiven you.'"

Under sharia, the Koranic legal code that prevails in Saudi Arabia, the fate of convicted murderers is determined by the families of their victims, whose adult heirs cast votes on the sentence. For 17 years, through the three mandatory appeals required in all murder cases, Saudi magistrates had been working ceaselessly to nudge the Banayghs toward a pardon.
"The judges talked to us many, many times," Muhammad Banaygh said. "'To forgive or not is your right,' they explained. But they wanted



## their religion: a heavenly ordered state.

us to forgive, because that's what the Koran asks."
This is what Saudis see in their nation, and their religion-and what they would like the world to see as well. Not the hijackers of September 11, who branded the kingdom with the stigma of terrorism, but a heavenly ordered state in which mercy is a paramount virtue. Not the grim spectacle of a public beheading, but the intense faith that can halt it, based directly on the Prophet Muhammad's account of God's word as revealed to him on the Arabian Peninsula nearly 1,400 years ago and recorded in the Koran.

It is difficult today, in the fog of current events, to imagine how breathtakingly open and humane Islamic justice must have seemed at its inception, at a time when much of Europe was still reeling from the arbitrary whims of feudal lords.

Mercy and imagination, in fact, were once Arabian hallmarks, principal elements in the revolution wrought by the Prophet Muhammad in the era that Europe knew as the Dark Ages.

Those same centuries were a golden age for Arabs and Islam, an explosion of creativity marked by an openness to--even an obsession with-knowledge and science. Its principal discoveries were made in the ninth century, when scholars in Baghdad set about translating the chief scientific and philosophical works of foreign cultures and classical antiquity.

In concert with Indian mathematicians, Arab scholars perfected the modern numerical system, wrote the first treatise on algebra, and formalized the discipline of geometry. They made pioneering advances in astronomy and

Swirling winds in the mountainous Asir region are like religion and politics in Saudi Arabia-a potent force that's easier to feel than forecast. Will reformers find a modern path, or will the hardliners prevail? What about al Qaeda and the Saudi duel with terror? Faced with plenty of hard questions, will the Saudis look inward, or heavenward, for answers?

## "If we are to survive as a nation, we have

physics, inspired by Greek texts that had been suppressed as "pagan heresy" in the West. Arabs invented the paper mill; its inexpensive substitute for parchment helped to launch the publishing industry.
"The highest achievements in science and technology were once found in the Islamic world," a senior figure in the Saudi bureaucracy said, as he took me on a tour of the King Abdul Aziz National Library in Riyadh, the country's largest library. "But that was a thousand years ago."

He gestured at the shelves around us. The collection, he pointed out, totaled 500,000 books-one-tenth the holdings of the main public library
in Cincinnati, Ohio. "More important, you'll find very few key recent works from Europe, America, or East Asia here."

The contrast with Islam's golden age is devastating. According to the UN, a scant 330 foreign books are translated into Arabic in an average year. In Spain alone, 16,750 foreign books were translated in 2001, more than the total for all Arab nations combined in the past 50 years.
"If we are to survive as a nation, we have to be fully part of the world again, fully engaged in it," my guide to the library said. "We have to rid ourselves of the belief that we can protect our culture, protect Islam, with closed minds."

It is a refrain that a visitor hears often in 2003,


## to be fully part of the world again."

an idea that is gaining momentum to counter the voices of extremism. A delegation of reformminded Saudi professionals, intellectuals, government officials, and businessmen held an unprecedented private meeting earlier this year with Crown Prince Abdullah. In effect it was an emergency majlis, and its theme was the need for a new openness, buttressed by proposals for democratic elections, a dramatic reordering of the relations between men and women, and freedom of religion.
"The time has come to reinvigorate the national soul," Abdullah himself declared in a speech a few days later, "[and] prove that Arabs are able to establish themselves as a living nation."

I thought of Wafa, the science teacher, as I read Abdullah's words, and of the protodemocracy I'd found among the Bedouin. A new golden age is being dreamed of in the kingdom, to reconcile the struggle between the past and the future, between the mutawaeen and the cell phone, between the seventh century of the Prophet and the fast-changing world of Muslims today. Its outcome will determine the future of Saudi Arabia, and quite possibly the future of Islam on this Earth.

## WEBSITE EXCLUSIVE

How hard is it to cover Saudi Arabia? Find out in tales from the field, see more of Reza's images, and join a U.S.-Saudi forum II national geographic.com/ngm/0310.


SERIOUS CLAWS AND ROUNDED
EARS EARNEDIT THE
NICKNAME HONEY BEAR, ANDITS
AGJLE HANDSAND BRANCHGRASPING TAIL SUGGEST
A MONKEY, BUTTHEKINKAJOU ACTUALLY BELONGSTO THERACCOON FAMILY,


THEKINKS |

## "At night you hear them call," "syys photographer Mattias

Klum. "It's a short, barking wee-wee-wee that seems to say, This is my tree, stay out of it." But after any initial suspicion, kinkajous had no problem sharing their trees with humans willing to camp on their own level, a hundred feet above the ground in Panama's rain forest canopy. Klum and his assistant spent night after humid night perched on branches of flowering balsa trees, wearing camouflage clothing and scanning the forest with night-vision goggles. "At first we stayed at least 20 feet from the blossoms where they came to feed," says Klum. "Once they accepted us, we moved closer and closer. There was a real connection."

Klum was working in the research territory of zoologist Roland Kays of the New York State Museum, who began his study in Panama ten years ago. Back then, little was known about the behavior of kinks (as Kays likes to call them) in their New World tropical habitat. About the size of a small house cat, they have few predators. "If you can find them," says Kays, "they don't run away."


DRINKING DEEPLY, A FEMALE NAMEDHOTUS
BYZOOLOGIST ROLAND KAYSEXCAVATESTHENECTAR OFA BALSA BLOSSOM. POLLEN COATSHER FACEAND MAY FERTILIZETHENEXT TREE ON HER ROUTE, "SOMETIMES

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IN CERTAIN BALSA BUDS PHOTOGRAPHER MATTIAS KLUM NOTICED HOLES HETHOUGHT TOO SMALLTO COMEFROM KINKAJOU BITES. LATER HE NABBED THECULPRITS: ORANGE-CHINNED PARAKEETS STEALING NECTAR WITHOUT POLLINATING THEPLANTIN RETURN. KINKS COMEALONGANDLICKUPTHELEFTOVERS (ABOVE), A SIDEDISHTOTHEMAIN,FACE-DUSTINE MEAL (BELOW).


## Not rare, but hard to find.

That's the dilemma Roland Kays faced when he began to study Potos flavus in Soberanía National Park near the Panama Canal. "Everyone assumed they were solitary, because you usually find them alone," he explains. But no one knew what was actually going on up in the canopy at night. Kinkajous rarely come to ground, and they sleep all day in tree holes. So how to fit them with radio collars for tracking? Kays devised a system for hoisting traps into trees. Next problem: How to lure kinks into the traps? They're classified as carnivores because of their skull structure and teeth, so Kays tried chicken as bait. No takers. He'd heard reports of pet kinkajous raiding owners' liquor cabinets, so he tried fruity peach schnapps. The kinks abstained. Then he considered the novelty of bananas, which don't grow in this forest. The kinks bit.

Kays's research, partly funded by the National Geographic Society, shows that kinkajous here live almost
 entirely on fruit, especially wild figs. They lap supplemental balsa-flower nectar with a long tongue. "Ecologically, they aren't carnivores," he says. Using DNA and radio-tracking-and following the kinks for neck-craning hours with flashlight and bin-oculars-Kays discovered an unusual social structure. A female, two males, a subadult, and a juvenile typically make up a family, sleeping together and grooming one another but usually foraging separately. Unlike most mammals, it's the female that leaves home when sexually mature, at about two and a half years. The turf passes from

## WEBSITE EXCIUSIVE

What kind of word is "kinkajou"? Find oul in Did You Know? - plus catch Slghts $\&$ Sounds with photographer Mattias Kum: nationalgeographic.com/ngm/0310.
father to sons, and males develop stronger bonds than females. "Once I saw a father and young male playing in a fig tree," says Kays. "They were hanging by their tails and boxing each other in the head. ${ }^{n}$

"I TRACK BY NIGHT AND TRAP BY DAY," SAYS KAYS, BAITINGACAGE WITH BANANAS A HUNDREDFEETUPIN AFIGTREE.LOWERED

BYROPETOTHEGROUND,TRAPPED KINKSARETRANQUILIZEDAND EXAMINED, THEN RELEASED ONLY WHEN FULLYALERT.



NUZZLINGFORATTENTION,
AJUNTILEMAYTRYA MOTHER'S PATIENCE, 10 OFES SEEMOMGETKINDOFFEDUP,* SAYSKAYS KINKS USUALLY BEAR ONEPUP
 ASHDNEMSFOURMONTHS

|GROUNDFM|
A SMOOCH FROM MARRON TICKLES A VISITOR
AT PANAMA CITY'S PARQUE NATURAL METROPOLITANO. GIVEN UP
BY A PET OWNER, MARRON RELISHES THE TOUCH OF CHILDREN AND IS KEPT OUTSIDE HIS PARK CAGE (BELOW)ASMUCHASPOSSIBLE. AS FOR KINKSAS PETS,KAYS CAUTIONS: "UPALLNIGHT, CAN"T BEHOUSEBROKEN."



HKINKAJOUS HAVEANETWORKOF ROADS INVISIBLETOUS BUTVERYCLEARTOTHEM, TH SAYSKLUM. WECATCHGLIMPSES\%

ADDSKAYS, "EUTTHEREARESTILLPLENTY OFQUESTIONS. ${ }^{\text {O }}$




Fabled land between two rivers, Mesopotanaia is rich with artifacts, such as this ancient figurine (above). For centuries famers, priests, and generals wove a complex, often bloody history in the region that i now lraqlaaving traces sought by archaeologists as well as thieves like this one (below) at Isin.


# "Don't shoot! We're Americans!" Henry Wright shouts as he thrusts his head out the window. It's dark, but dead center in our headlights is a jumpy young U.S. marine aiming his weapon at the windshield of our white SUV. This team of archaeologists and journalists who've come to 

assess the damage to Iraq's ancient sites had been warned of armed looters, not friendly fire. But cruising the backstreets of the battered town of Nasiriyah after dark in search of the local museum, we've run into a Marine roadblock. The museum, we discover, is now a military barracks.

Grim tales of mass looting have brought our expedition, sponsored last May by the National Geographic Society and led by Henry Wright, a professor at the University of Michigan's Museum of Anthropology, to this dusty place where humanity's first great cities once dominated the vast Mesopotamian plain. While media attention has focused on the loss-and recovery-of artifacts in Baghdad's Iraq Museum, we're investigating reports that povertystricken villagers and organized bandits are ransacking ancient mounds across the country, feeding the foreign appetite for antiquities. The five archaeologists on the team are anxious to see what's happened to the sites in the decade since the 1991 gulf war prompted U.S. restrictions that kept Americans from digging in Iraq.
Our expedition finds both tragedy and reason for hope. Some sites resemble moonscapes, cratered with freshly dug holes and trenches where looters may have
ripped out more artifacts in a few weeks than archaeologists have excavated in decades. Others shimmer intact and silent in the desert heat. While half the expedition team travels through southern Iraq, the other half probes the situation in the north, where the damage is less dramatic but still a cause for serious concern.
In Nasiriyah we are in luck. Marine Maj. Glemn Sadowski is extremely helpful. He has organized an armed escort to take Iraqi archaeologist Abdul Amir Hamdany to survey the local sites, and he invites us along. The two men are an unlikely duo. Sadowski is a strapping reservist whose platoon lost seven men during the 1991 gulf war. Hamdany is a soft-spoken scientist who's been evicted from his own museum, where off-duty marines are pumping iron to heavy metal music. Neither speaks the other's language. But Hamdany returns day after day to stand on the burning sidewalk and ask Sadowski's help. "In the bazaars they are selling antiquities," he says. "We have to do something."
The aim of the National Geographic survey is to put a spotlight on the crisis. Without U.S. troops or paid Iraqi guards providing round-the-clock protection, many sites will remain vulnerable. Keeping Iraq's treasures safe will require a level of security that at this point is elusive at best. But Hamdany knows that careful assessment of site damage is a critical first step. "You can tell he has a passion for this," Major Sadowski says, after agreeing to supply the escort. "If's the least I could do." On such slender threads of trust and respect hangs the future of Mesopotamia's past.

## C. Elizabeth stone, archaeologist <br> What fuels this destruction are those in the West who buy illegally exported

antiquities - it's just like the drug trade. Why does the looting matter? Because each illicit hole is a small rent in the fabric of history. The aim of history is to humanize the past, but each object ripped from its context loses its connection with its makers and users, loses its voice, and becomes mute, mere pretty thing. And in this part of the world, many of the objects indeed speak. Mesopotamia's


Elizabeth Stene peers into a looters' hole at Dahaila, last occupiad 3,700 years ago. written tradition survived the vagaries of time because it was inscribed on sturdy clay tablets. Private letters, contracts, works of literature, and records of institutions can be found in the buildings where they were created. But the tablets in the antiquities market? They can't tell a story. Often the less salable bits and pieces are ignored or destroyed. Some of the key texts archaeologists have preserved, such as the Sumerian version of the biblical flood story, were painstakingly assembled from fragments. Today's looting means we will never know what was lost. For instance, we'll never know anything about the cemetery at Dahaila. We were stunned when we reached this important area where tens of thousands of people lived 3,700 years ago and that now lies deep in the desert. Looters clearly found the place productive - there were holes everywhere. I'd aiways wanted to excavate here. Since this was a short-lived city, its tablets and artifacts could have provided insights into the old Babylonian period. To halt this destruction, nations need tougher laws to discourage collectors, tighter border controls, and awareness among politicians and the public that our shared human heritage is nonrenewable."

[^3]such an item receives only a tiny fraction of that amount.

A lone marine walks down a street ie Babylon (below), the city where Nebuchadrezzar II once ruled. Saddam Hussein reconstructed it as a tourist spot. Before U.S. forces arrived, angry mobs trashed the nearby museum and burned the gift shop while an elderly caretaker unsuccessfully tried to hold them off with sickle.



## "

McGUIRE GIBSON. ARCHAEOLOGIST
When the Marine helicopter swooped down over the ancient
city of $3 \sin$, we saw two or three hundred looters destroying the site. They actually smiled and waved at us-they had no idea we had come to halt their illegal dig. We told them what they were doing was forbidden, and the marines with us fired shots over their heads to hasten their exit. We did the same at Umma, but as we were leaving, we could see the looters coming back to work. Our survey of remote sites in southern Iraq painted a terrible picture. Iraq used to have strict regulations and a fierce pride in


McGuire Gibson, Ieft, and Henry Wright view returned artifacts at the lraq Museum. protecting its cultural heritage. Looting wasn't If problem until the mid1990s, when poverty brought on by UN sanctions pushed local people into digging for antiquities to survive. Fortunately our Iraqi colleagues began legal excavations at places like Umma, and that discouraged illicit looting. But this war has created an unprecedented crisis. Iraq is probably losing more of its antiquities from the ongoing pillaging of these sites than were taken from its museums in the days immediately following the war. Clearly, this devastation must be stopped, and an occasional visit by a helicopter is not going to save these sites."

[^4]

Cugizin chible.s. A young marine (below) relaxes in the cool al the Nasiriyah Museum, which exhibits replicas of ancient statues. During the 1991 gulf war the museum director hid the real artifacts from rampaging mohs; this time they were sent to Baghdad beforehand for safekeeping. The angry husband of today's curator complained to U.S. authorities about their occupation of the museum, which aiso serves as the family's home. One private replied: "If the guy can find a fight back home for a thousand $\mathbf{t}$ i us, he can have his house back." Ctesiphon \{left\} was home et Sasanian rulers ty the third to sixth centuries A.D. With no guard and no fence, grafitit, bricks ${ }_{r}$ and litter now mar the park.


# " 

 HENRY WRIGHT, ARCHAEOLOGIST Doing archaeology in Iraq takes muchmore than excavating and analyzing artifacts. That's one thing my wife and I learned when we were newlyweds in 1966 at Ur, the ancient Sumerian city that flourished 4,000 years ago: You have to win over the local leaders, since they provide the guards,


Heary Wright, let, and locai leaders meet at the tent of Sheikh Ali near Ur. the workers, the local knowledge. Right now, many of the site guards have been run off at gunpoint by looters. The ones who've stayed haven't been paid in months, and many are forbidden by the U.S. soldiers from carrying guns. Reestablishing local control over the sites is essential. After all, Baghdad is far away -then and now. Sir Leonard Woolley, who famously excavated the Royal Tombs of Ur in the 1920s, found out the importance of working with the local leader when his camp was attacked and robbed. Sheikh Manshet of the al-Ghizzi tribe took responsibility for the robbers, turned them over to the authorities, and assured Woolley there would be no more trouble. So whenil arrived at Ur in 1966 to study land use and settlement patterns in the region, my first stop was at the tent of Manshet's son, Sheikh Muhammad. During my fieldwork he asked me for a copy of the book he knew I would one day write about Ur. Muhammad has since died, but when I returned this spring I was able to present my last copy to his son, Sheikh Ali. I explained that I had come to fulfill a decades-old promise. My Arabic had gotten rusty. But the glasses of tea and the warmth of these people remained unchanged. If all goes well, a tribal leader's promise to protect an archaeological site will once again be valuable tool to preserve Iraq's past."

[^5]बहाlinitayhhlot The ninth-century A.D. spiral minaret al Samarra (right) and the 4,000-year-old ziggurat of Ur (below) reach into the pale blue Mesopo tamian sky. Many al lraq's sites have been reduced to rubble because mud brick: the building material of choice here, doesn't last fong. Thanks to baked brick and renovations, these two have managed is survive.

A spray of holes on one side af the Ur ziggurat, built around 2100 e.c., testifies to the ravages if modern warfare. Now an enormous U.S. military base encircles the site, providing protection from looters but also raising worries about archaeological damagge.

Situated on the Tigris, Samarra's vertigo-inducing minaret gives of hint ;) the grandeur this elaborate early Islamic capital, which fell into ruin when the caliphs abandoned il for Bayhdad in A.0. 892.



## If STEVE MCCURRY, PHOTOGRAPHER <br> I'd covered Iraq during Saddam's rule, even got arrested with the

 director of antiquities once. This time the sense of danger was palpable. It was dusk, and we were visiting the ancient arch of Ctesiphon south of Baghdad. An open-air gun market was in full swing nearby. Children with rifles roamed the area, which was full of dust and trash. Near the arch is a building with a vast mural of the seventhcentury battle of Kaddisiveh, a victory of Arab armies over the Persians. I'd photographed the painting in 1985, but now the building was dark and totally looted. It wasn't just that the glass was broken or that the fixtures were ripped out of the wall. You could feel some kind of mob rage. It was spooky."SAMARRA

Steve McCurry by Samarrés minaret.



6RANDY OLSON, PHOTOGRAPHER
It was strange being sent to a war zone to photograph dusty hills and artifacts-with a team that didn't always seem fully cognizant of the danger. At one point in downtown Baghdad I got out of our car to take pictures of a building on fire. The car left, and then the shooting started. People came running toward us yelling and screaming, and I realized my bulletproof vest was still in the car that had just left. I ended up backpedaling, elbow to elbow with other photographers as they pulled a half-dead Iraqi out of the burning building. These images had little chance of being published in a story about archaeology, but it was


## Rendy Otson in Baghdars with the communications building burning behind him.

 impossible to ignore the human drama of this place. When we reached Nimrud, an ancient Assyrian capital on the Tigris, it was being guarded by the 10ist Airborne. Before they'd arrived, looters had stolen two pieces of carved slabs. One of the soldiers, kid really, who was armed 13 the teeth, told me war stories as dusk descended on his first night at Nimrud. He confided that he was afraid to go to sleep because of the 'ancient ghosts.' When I got back home, I got a call from the people who'd sold me the bulletproof vest. They wanted to know how it had worked."CDW2 Whe Once the center of Assyrian power, Nineveh boasted gardens, temples, and a royal library surrounded ly massive walls (left). Now the site is being encroached upon we the modern city of Mosul. Within Nineveh's walls, King Sennacherib's palace lies exposed to surt, rain, and looters (below), The protective metal root has been stolen, and many of the carved slabs showing the king's campaignsdesigned ia intimidate visiting dignitaries-have been severely damaged from neglect and vandalism. Assyrian carvings sell for millions t| dollars apiece; one stolen from Sennacherib's palace surfaced If London during the 1990s but was eventually returned to lraq after a long court battle.


## 6 TONY WILKINSON, ARCHAEOLOGIST <br> American soldiers nearly arrested us at Nineveh. We had arrived in the morning

at the vast site-the nerve center of the Assyrian Empire in the seventh and eighth centuries B.C.-and wandered undisturbed. Much of the damage we saw was due to the general decay that had taken place over the decade between the two wars, when sanctions made conservation materials hard to come by. When we returned that afternoon, a haif


Tony Wilkinson gives an impromptu history lesson to soldiers getarding sites in Nineveh.
dozen U.S. soldiers intercepted our SUV and demanded to know who we were. It turned out for the best. We were able to introduce the soldiers to the Iraqi guard responsible for keeping an eye on the site for the State Board of Antiquities. They had never formally met. The guard spoke no English and was scared by the heavily armed soldiers. The U.S. officer, who spoke no Arabic, said he had seen the man around, but since he had no gun, he hadn't considered him a threat. Unarmed, he wasn't a threat to looters either. This was typical of the disconnect we saw between the U.S. troops and the Iraqi people. The soldiers don't know the land or the language and are navigating blind. As an archaeologist who always has to make strong contact with the locals, I found this strange. If the U.S. wants to protect these sites-and to be seen as liberators rather than occupiers-that human contact will be critical."

[^6]only minor damage. Winged bulls and lions with human faces stand guard at the ggates if Nimrud (below), but they didn't protect the site from loaters seaking more af the palace's riches. Nimrud's gold was unearthed in the tombs of Assyrian queens by Iraqi archaeologists between 1968 and 1990. Amarican soldiers now patrol the site, where more artifacts may stil! await discovery.





## $\mathfrak{f 4}$

 MARK ALTAWEEL, ARCHAEOLOGISTWe found unexploded tank shells all over Tell Billa, a site across
the Tigris River from Mosul. Like several places in northern Iraq, it was damaged from being used as an Iraqi military camp. The army had been preparing for an expected coalition attack from the north, which never came. Local villagers who found the live explosives and told us about them were terrified but didn't know what to do. Fortunately we had global positioning system coordinates, GIS databases, and mapscritical tools for modern archaeologists-which allowed us to report the location of the shells to the U.S. military at its head-
quarters in Saddam's former palace in Mosul. We also told them about unexploded ordnance near Khorsabad, an ancient Assyrian capital not far from Mosul. We hoped they would take care of it, but their to-do list is long. When we visited Tell Billa again,

Mark Attaweel, right, tells a U.S. Amy sergeant about the explosives near Mosul.

we saw children playing with the explosives (top). Of course we realize that protecting archaeological sites is only one of the challenges for the future of Iraq. My family comes from Baghdad, and I am saddened to see what more than a decade of war, social isolation, and economic sanctions have done to this country's people." $\square$

Mobishl Miza0 Though revited in the Bible as cruel and despotic rulers, Assyrian kings created the first truly international empire where trade, religion, and artistic ideas flowed frecly. Archacologists are hoping that new excavations at places like Nimrud (right) could begin as early as next year providing them with al fresh understanding an ancient culture that preceded the Persian, Greek, and Moman empires. But as Iraq's future remains uncertain, so does the future of archaedogy in the region. For more of Mesopotamis's rich history to emerge tomorrow, thousands of important. ancient sites must be protected from looters today. satroy ceson all

## WEBSITE BXCLUSING

- Listen to archaeologist Henry Wright talk about what lraqis ancient sites meay to the rest of the world. * Hear photographers Steve McCurry and Randy Oison. despribe the gritty realities of working in ạ war zone. - Get an update on the loouting of traqis antiquities nationalgeographic.com/ ngm/0310


NATIONAL
GEOGRAPHIC
RESEARCH AND
By Cheryl Knott Photographs by Tim Laman
EXPLORATION


## Cheryl Knott <br> Anthropologist <br> Gunung Palung

National Park, Indonesla
"At the current rate of habitat destruction, orangutans could be extinct in the wild in 10 to 20 years. We must stop this trend-the alternative is unthinkable."
$\square$


As illegal loggers close in, the race is on to safeguard the home of Borneo's imperiled orangutans.

I and my team of field assistants, managers, and students have spent more than 50,000 hours over the past decade observing orangutan behavior and documenting the apes' physiology. Our work investigates how the boom-and-bust cycle of rain forest fruits affects birth intervals and the length of juvenile dependency.
Recently we participated in joint effort with other scientists to look at orangutan "culture" customs passed from one generation to the next and often unique to particular populations. For example, Martina will grow
up threatening strangers by making kiss-squeaking sounds into $\quad$ handful of leaves-a behavior seen regularly only at our site. Some 500 miles west of Borneo in Sumatra, orangutans use sticks to pry calorie-rich seeds from prickly, hard-toeat Neesia fruits, a clever trick that youngsters pick up from the adults-and one that Borneo's apes have not devised.
Another significant find at our site was that fully developed adult male orangutans, known as prime males, stay in top physical condition only for a few years. Following females and

## Prime male Jarl Manis was in top condition In Aprll 1997 when Narromas

 Geoarapuic first took his photo (Inset, August 1998 issuo). But 19 months later (below) he was a shadow of his former self. Shriveled cheek pads Illustrate the difficulty of maintaining poak condition. Marlssa's baby, Martina (right, at three years old), was illely fathered by larl during hits prime.THE PROIECT
STUDY SITE: GUNUNG
PALUNG NATIONAL PARK
PARK'S ORANGUTAN POPULATION: ABOUT 2,500
WORLDWIDE POPULATION: 15,00024.000 IN THE WID

CURRENT RESEARCH: STUDYING
ORANGUTANS' INDIVIDUAL RANGING PATIERNS, JUVENILE DEVELOPMENT, AND MALE AND FEMALE MATING STRATEGIES AND REPRODUCTION
fighting with other males wears them down, diminishing mascur line traits such as full cheek pads and large throat pouches and curbing certain behaviors like mating and long-calling-- loud bellowing made to announce their presence. As these features disappear, males become what I call past prime, a condition that usually signals




the end of their reproductive life cycles.

Many orangutan males delay developing prime traits for several years, although they're still capable of fathering offspring. I believe the environment may be partly responsible. Natural plant cycles cause severe fluctuations in fruit production. During shortages orangutans consume fewer calories-and in females

As go the trees, 50 go the oranglytans. Deep II Gunung Palung, illegal logging has transformed another forest glant Into planks (left). Raln forests might recover from a small amount of selective logeting, and some orangutans could endure such incursions. But the ongoing destruction surely threatens their long-term survival.
this translates to lower fertility. In response males may wait to attain their prime condition until a future time when food is more abundant and they have the best chance of reproducing.

Sadly that future looks bleak for orangutans. By some estimates more than 80 percent of all orangutan habitat has been destroyed. Deforestation in Indonesia is escalating; since 1996 legal and illegal logging has consumed about five mir lion acres of forest each year. Recent political upheaval has brought economic turmoil and lawlessness-hardly arecipe for successful conservation.

Populated with about 2,500 orangutans, Gunung Palung is one of their last strongholds. Overall, however, orangutan
numbers are falling: The 15,000 to 24,000 remaining apes (endernic to Borneo and Sumatra) could vanish within the next 20 years.

Meanwhile, Marissa, Martina, and the others here have much to teach us about how to ensure their survival. And through our educational outreach programs and awareness campaigns around the park, we are drawing public attention to the orangutans' plight and helping to make - difference. It would be tragic to let these great apes slip away. []

## WEASITE EXCLUSIVE

Want to leam more about orangutans?
Post E question to anthropologist Cheryl Knott, then read her weekly replies at nationalgeographic.com/ngm/0310.




ission to the underworld complete, Arturo González rose up the narrow well shaft dangling in a metal chair, his black wet suit dripping, the rope inching through the squeaking pulley above his head. González, a Mexican underwater archaeologist, had just dived to the bottom of a hidden sinkhole that lies 70 feet below an old stone well in the thorny jungle of the Yucatán. In his hands he held a lidded plastic tub.

Encircled by the strong arms and expectant faces of his team when he reached the surface, González sought out Carmen Rojas, the young archaeologist who was co-director of his research project, and handed her the tub. "Don't drop it," said González, a boyish 37 -year-old with a stout heart and a perpetually quizzical look on his face. Rojas ignored the comment and carried the tub to the open-sided conservation lab behind the abandoned hacienda, where Alejandro Terrazas, a physical anthropologist, waited impatiently.

They removed the lid and looked inside. Terrazas slowly picked up the skull and cradled it in his hands. He smiled. It was hundreds of years old and darkened to the color of burled oak, but he could envision how flesh and skin had filled out the young man's Maya face, and how his dark eyes might have stared, if not smiled, back at him.

The man had been about 25 , with a forehead that slanted radically back from the eye sockets because boards had been clamped around his malleable cranium when he was an infant, for fashion. He had died violently; the skull was cut, as if someone had hacked it with a knife.

Terrazas peered closely at the cut marks. "That looks like defleshing," he said, the process of removing the muscles from the top of the victim's head down the face.

LIVE VICTIMS were thrown into the sacred cenote at Chichén Itzá on the premise that, as sacrifices to the gods, they would not diethough they were never seen again. I scanned the slick limestone walls, and my heart pounded, feeling their terror.


A gaping jaw evokes the pain of a Maya, perhaps a sacrificial victim, his darkened skull resting in the sand for hundreds of years. Knife marks on a similar find suggest that some victims were ritually mutilated. Cave diver Martínez (opposite) dangles in the well shaft that leads to the underwater grave.

Perhaps a human sacrifice. It was the first skull with signs of defleshing found in the clear depths of the 20 or so freshwater pools, or cenotes, explored in the past two years by the team from the Underwater Archaeology Area of Mexico's National Institute of Anthropology and History (INAH). Terrazas, himself a young man, with a thin black beard and the kind, moist eyes of an undertaker, betrayed no sense of horror. He gently placed the skull into its nest of wet cotton swaddling in the tub-a gesture you might see in a hospice.
"For the Maya the body was a vehicle for the journcy to the afterlife," he said. "When a Maya priest made a sacrifice, he was operating in his special universe-helping that universe to continue. Good or bad aren't factors. I don't want to make moral determinations; I want to understand."

The INAH team was first led to the site by Wes Skiles, a bearded, broad-shouldered explorer and photographer from Florida, with crinkling eyes in which vulnerability and bravado tend to tussle. Skiles headed up a documentary team that joined the INAH scientists for a three-week expedition.

The expedition-part of an ongoing six-year survey to inventory all cenotes of scientific and cultural interest-was spurred by a sense of urgency. In recent years the cenotes and submerged caves that riddle the porous limestone of the Yucatán Peninsula, both Yucatán state and neighboring Quintana Roo, have been probed, explored, and sometimes damaged or looted by a growing number of sport divers. Along the coast known as the Maya Riviera, as many as 10,000 a year enter cenotes. The INAH archaeologists were eager to work with sport divers to document as many cenotes as possible before

they were compromised further.
"Every time a sport diver moves something, we lose a piece of the puzzle," said Pilar Luna, director of underwater archaeology at INAH, who founded the discipline in Mexico almost three decades ago. Only in the past five years have archaeologists here acquired the necessary skills in cave diving to do a systematic survey of the cenotes. "We're finally getting wet," she said.

Camped among the ruins of a plantation in a thorny forest, the INAH team was hoping to learn more about the ancient Maya, who considered the cenotes sacred entrances to the underworld, and also about the fossil evidence and geology of the formations, which offer clues to the prehistory, and pre-Maya history, of the peninsula. Already the team had found evidence,

> THE SKULL revealed telling knife marks. "At first I didn't think we would find these kinds of sacrifices in rural cenotes, but now it seems I was wrong." Terrazas grinned. "It's wonderful to be wrong."
in the form of carbon-dated ash, of a 10,200-year-old bonfire -the oldest recorded site of human occupation on the peninsula. The multidisciplinary team hoped to use its findings to produce scientific articles, a book, and a traveling exhibit. It also hoped to leave local communities better equipped to protect the sites.

The Maya civilization arose around 600 b.c. and dominated a vast area of what is today Central America and Mexico from the time of Christ to A.D. 900 , when many of its city-states collapsed amid political upheaval. It produced sophisticated architecture and art and developed math and astronomy that rivaled that of the Arab and Hindu worlds.

Many Maya still live in the northern Yucatán Peninsula, a tough, hot, prickly country-a slab

of limestone roughed over by tropical scrub forest. It has no rivers, no runoff. Rain percolates swiftly into the cenotes and flows to the sea unseen, through an underground labyrinth. It's like a still photograph, rather than a film: timeless, if not a bit stifling. Rivers have always provided a sense of motion, a narrative of beginnings and endings, travel and discovery. Without them the physical world stands still, drip-drying.

To ensure rain and sunlight, and to keep the subtle balance of nature, Maya priests appealed to Chac, the sustainer of life and the god of rain, who lived deep in the cenotes. (Pronounced suh-no-tays, the word comes from the Maya dzonot, meaning abyss.) When drought, war, or other dangers threatened, the Maya performed elaborate rituals and pierced their tongues and earlobes with stingray spines, collecting their blood on parchment for burned offerings. On occasion, a high priest would open a victim's chest with a stone knife and tear out a beating heart.
"Most rib fractures from accidents occur from the outside in," Terrazas said, examining a skeleton, "but ripping out the heart caused breaks from the inside out." He looked up from this horrendous technicality and offered, blandly, "This is a good indication of intentionality."

Such rib fractures would have been welcome news for the archaeological team, clearly signaling a sacrificial victim. None had been found, yet there was still the skull with signs of defleshing, another type of sacrifice.
"At first I didn't think we would find these kinds of sacrifices in rural cenotes," Terrazas said, "but now it seems I was wrong." He grinned. "It's wonderful to be wrong."

Many of the cenotes formed as a result of a city-size meteorite slamming into the region 65 million years ago, generating a global cataclysm. Giant waves inundated shorelines, and fine dust blotted out the sun and cast the world into darkness. Most

scientists now accept that the meteorite helped trigger the K-T (Cretaceous-Tertiary) mass extinction, which included the dinosaurs.

Millions of years later fractures appeared in the limestone that overlaid the perimeter of the 110 -mile-wide crater, leaving a ring of underground chambers that filled with rainwater. Over time, the limestone that covered the chambers eroded, thinned, and collapsed, exposing the waters and the complex of fractures as cenotes.

These ring cenotes, whose epicenter is near the village of Chicxulub on the mangrovefringed north shore of the Yucatán, extend, remarkably, into the sea. At high tide the offshore caves expel fresh water, which bubbles at the surface. Local residents call these fountains ojos de agua, eyes of water.

For now the eyes of the underwater archaeologists were on the inland cenote that yielded the skull. While they camped around the entrance, the U.S. documentary team made its headquarters in a small village nearby. I joined the explorers, technicians, and biologists as they hung their hammocks in the village's 16thcentury colonial church, on the plaza where the buildings flashed bold colors and music honked as a traveling carnival dismantled its carousels and popcorn stands. It was the week before Holy Week, two weeks before Easter. That first evening our host, the local padre, pulled his VW into the sanctuary and parked between the pews, as he always does, to guard the church. The night air was heavy with woodsmoke and henhouse smells. The sky outside throbbed with stars.

The village was in the selva espinosa, spiny forest, a region routinely cut since Maya times, and so ravaged by centuries of grazing animals that the only vegetation left protects itself with spines or needles. Yucatán had once thrived on henequen, or sisal, a spiky agave used to make rope fiber. Sisal peaked in the early 20th century, then collapsed, leaving grand haciendas abandoned and the economy destroyed.

The cenote the teams were exploring is one of about a hundred in the immediate area. At the top, it appears like a simple three-foot-square stone well, sitting in the courtyard of a vine-choked hacienda, where only a few cattle pens remain. An old man, Tenne Chuk Awum, arrives each morning on a bicycle to herd the cattle to pasture and to pump water
from the cenote for their trough. But now the teams had formed a small town here, with roaring generators and air compressors for diving tanks, a dusty parking lot of 20 cars, and more than 250 crates and boxes of gear that weighed five tons.

Wes Skiles's team had lugged two remotely operated vehicles (ROVs), the size of microwave ovens, to the Yucatán to probe below the halocline, the boundary layer where lighter fresh water gives way to heavier salt water.
"I think we've been diving in the attic spaces of this system," said Tom Iliffe, a marine biologist from Texas A\&M University who studies aquatic cave-dwelling animals. "Most of the structure of the cenotes is below what we can reach with scuba, which has a limit of about 200 feet deep. It's like the far side of the moon. No one knows what's down there."

Day after day the underwater archaeologists formed an ant-like parade as they descended in masks and black wet suits down the well shaft to silent, sunless waters where most creatures are blind and white. The goals were to map the cenote, locate artifacts, film them as they lay, label them with numbered tags for future

studies, and bring up samples. Canoes and a rubber boat served as diving platforms on the water's surface. Nothing came easy in the cenote. Each diver took three light sources, and two of everything else: breathing tanks, regulators, masks. Some wrestled with cameras, lights, and video equipment, others with slates and pencils. In charge of all these logistics was the third codirector of the project, diving instructor Octavio del Río.

One day the sheer size of the electrical gear


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and lights blew the circuit breakers. None of the winches worked, and the batteries for the lights had drained like dishwater. The teams ended up hauling equipment and men by hand, like stevedores, up and down with a rope attached to a metal basket. They later settled for an old, muffler-challenged VW that belonged to one of the workers. The car became the winch.

But the system was hazardous. Once four $60-$ pound diving tanks broke loose from the lift and plummeted through the shaft, wiping out part of the lighting system laboriously laid just above the water. The tanks missed diver Scott Braunsroth by about a foot.

Pedro Tum Ortiz, one of the local men who'd been supplying muscle to the ropes, later confided, "Holy Week is a dangerous time to go to the cenotes. God is resting, and the waters will move. Sometimes you hear noises, cocks crowing, and jaguars. Once I went to a cenote with friends to bathe, and we had to grab on to the ladder so the water wouldn't suck us under."

On the third day it was my turn to test God's vigilance, letting the metal chair plop me down into the cool pond like a piece of bait. Treading water, I adjusted my eyes to the moonlight of the cave. The cenote was shaped like an old Chianti bottle-a narrow neck leading to a wide chamber about 90 feet across and 120 feet deep. The bottle was half full, the water surface 35 feet below the domed ceiling. Stalactites dripped, and the roots of trees were spread on the walls in delicate dark webbing. Spanish records tell how live victims were thrown into the sacred
"We've been diving in the attic of this system," said biologist Tom liffe. "It's like the far side of the moon. № one knows what's down there." cenote at Chichén Itzá, a major Maya city, on the premise that, as sacrifices to the gods, they would not dieeven though they were never seen again. I scanned the slick limestone walls, and my heart pounded, feeling their terror.
Sinking deeper into the white noise of pressure, I bottomed out at 50 feet and glided across piles of shattered limestone. A side cave, shaped like a sock, spun down and off to the west. Resting in the sand was a mahogany-hued skeleton,


Cenote waters plummet hundreds of feet into darkness, home to eyeless fish like this four-inch-long Ogiloia pearsei. Deeper still, some of Earth's oldest crustaceans thrive in oxygen-starved waters. Equipped with powerful lights and yellow rebreathers for long dive times (above), a U.S. documentary team carefully enters a cenote to test remotely operated vehicles in this new environment. An ROV (right) transmitted still photos and video images of animals.

already tagged, the eye orbits of its skull bleak with expectations of eternity.

A few days later the INAH scientists brought him up. It was the first skeleton of its kindwith all its bones in their natural positions, undisturbed-ever found underwater in the Yucatán. He was a large man, perhaps 50 years old, well past the Maya life expectancy. "His health was bad," said Terrazas after examining the bones, "with arthritis so severe that he could barely flex his hands. He had terrible teeth prob-lems-gingivitis-and he probably had a very hard time chewing."

He was lying face up on the sand. Was it an accident? "No," said Terrazas. "There are nine skeletons down there [eight are partial]. Maybe one is there from an accident, but not nine."

When the car winch pulled up the bones of the old man, the three women who had made quesadillas for us the previous night were standing by the well. I asked them what they thought of our mission.
"We didn't expect skeletons," said one, Olegaria Chiku. "For us, a cenote is just a hole with water. But my mother lived around here, and she said that we needed to give the cenote 15 virgins, and God would open up a road to bring in the gold that we know is down there."

Until the 1960s many people, including many archaeologists, thought virgins were the only individuals whose stories had ended in the cenotes. "We learned then that they were not all young girls," said Carmen Rojas, the underwater archaeologist who oversees data processing for the survey project. "And now we know that they were not all sacrifices."

The most striking evidence came one Saturday afternoon when Wes Skiles discovered what turned out to be one of the most important finds of the expedition. Only eight feet underwater, in a small hidden niche, was a full skeleton in a funerary position on its back, its

"Each cenote is a box of surprises," says project co-director Octavio del Río (right), who holds one of $\mathbf{1 1 5}$ skulis found in what may be a funerary deposit (left). Only a few were brought up for brief study (above) or transported to Mexico City. "We're not making a museum collection," says Judy Logan. "This is a situation where you have human sanctity and emotion."


## Peering down into

 a chamber beneath the seaffoor 400 yards offshore, diver Andreas Matthes confronts the rushing current of a freshwater fountain. These sites are part of the interconnected system of more than 3,000 cenotes that underlies the Yucatán. At high tide they blow out fresh water; at low tide they suck salt water back into the system.
knees up. In front of it were three ceramic pots of offerings, one containing the skull of a dog. The bones of a bird lay buried in the silt nearby. The Maya held both animals to be supernatural, often mixing their physical features in art and legend. They were to the Maya, as to the Aztec, potent symbols of death. The remains must have been deposited there when the water level was lower, said Rojas, by people swimming with the body, or using a boat.
"The condition of all the bodies we've found tells us that the Maya deposited their dead in cenotes in at least two ways," she said. "Some bodies were deposited with care, while others were thrown into the water."

The day the archaeologists brought up the skeleton, the old herder from town showed up wearing a white shirt, his Sunday best, and sat solemnly by the well. "I just wanted to watch my ancestors come home," he said.

There would be other ancestors. By the second week the INAH team members had charted the remains of 15 individuals. In the mornings they would huddle around a computer screen to review the finds. After everyone had weighed in, Rojas and González would select the items they wanted to bring to the surface for study.
"By bringing the conservation lab and specialists of many disciplines to the sites, we can make a diagnosis quickly," said González. "It has worked well. We will be analyzing our results for years to come."

The finds here in the countryside are much different from those at extravagant cities like Chichén Itzá and Dzibilchaltún, said Terrazas. "Here we don't have the rich deposits of gold and jade."

To explore the offshore half of the ring, Skiles's documentary team drove to the coast, hired a fishing boat, and motored up to a fearsome boil on the sea surface a quarter mile out, as the wind raked the water into whitecaps. The hole was expelling fresh water; low tide would reverse the flow. Veteran cave diver and biologist Tom Morris dived in with mask and fins. "It goes down into a small hole about the size of a manhole cover," he said when he surfaced. "It's gonna be a kick-butt flow."

We threw on our scuba gear and plunged in. Skiles and Morris forced themselves straight down into the cave, like swimming into a fire hose. I followed them, gripping the rocks, pulling through the blurry convergence zone of fresh and salt water, pumping furiously with my fins.

A disk of brilliant blue shone at the bottom of the tunnel. It was Morris's lamp in the clear water, but it looked like the bright eye of the sea, as wondrous as anything Alice saw down the rabbit hole.

Soon after I caught up with them, Skiles and Morris disappeared, penetrating the two caves that led off from the bottom. I waited and waited and then returned to the boat. They were gone for two hours, under the sea, under the ground. I worried.

But they came back happy as puppies. Both fractures ran in line with the rim of the old crater, Skiles said, confirming that we were on the ring; one was reaching toward a spring in a mangrove swamp that we had already explored. They followed one for at least a thousand feet, wriggling through crevices so narrow that their face masks were dragging in the mud. Foot by

> NORTHERN YUCATÁN is tough, prickly country-a slab of limestone roughed over by scrub forest. It has no rivers, no runoff. Rain percolates swiftly into the cenotes and flows to the sea unseen.
gritty foot, pushing the limits of human ability, they were burrowing into the corpus of the ancient disaster site, a vast underground world that has defied examination.
"It's inhuman to lie comfortably in that scenario," Skiles said later. "Being under the sea bottom, one by one your senses are taken away from you. It's most people's worst nightmare. It's a tomb you're moving through, and if your brain switches over to think those thoughts, you become very dangerous. You end up making stupid and deadly mistakes."

The cenotes are true time capsules, and the Maya finds were only part of the yield. Debris and deposits have rained into the cenotes for centuries, and depth and darkness have protected them. The rise and fall of ice ages is written on their walls, and the fossilized bones


In this labyrinth divers explored passages so narrow that they sometimes scraped floor and ceiling at the same time. Rout 1 led inland beneath mangrovy swamps; route 2 dead-ended.
"Being under the sea bottom," says explorer and photographer Wes Skiles, "is most people's worst nightmare. It's a tomb you're moving through, and if your brain switches over to think those thoughts, you become very dangerous. You end up making stupid and deadly mistakes."
A subterranean sun radiates beendert
floodights iw a henware fermentias
tome ef the ridn ead cher wa che chap
way to an undergecencl worth that be init
beginning to be fully undaratond
-if prehistoric animals are preserved in their sediment. The INAH team found fossils that are 10,000 to 20,000 years old-a camelids a giant armadillo, an extinct horse. All are from the Pleistocene, a time when the Yucatán Pen= insula was covered not with low forests but with dry grasslands.

It was Good Friday when we left the inland cenote and hauled all the gear to the front foom on the church. A procession of villagers was re-creating the stations of the cross; fesus was portrayed by a young man with a beard painted on his chin. "All my work involves the way human beings confront their death" Terrazas had said weeks befores "because it's a good indication of the way they have confromed their lives. We need this death in order to understand life. The key moment of Christianity is also = human sacrifice- the Crucifixion. I think we are touching on some delicate parts of the human being."

At the church; right by our equipment room, Jesus was maised up on the cross, his feet resting on small platform. Mary mourned. And then, when the villagers had carried him away, there was joyous rush for the cold rice-water drink, served every year on the corner of the church steps.

That aight the padre's VW again sat, bug-eyed, between the pews. I hung my hammock in the hallway, between, iln damp walls, and suffered through the mosquitoes until the roosters crowed. The sun rose, It would set tonight. And is would rise again, confirming the Earth's eapacity for amaze. $\square$

## - M11 14

Learn how explorers and underwaler archazologisls brave danger and work together to protect the cultural fieritage of the Yucatán at nationalgeo graphic.com/ng m/0310.


## M



IS TIME,RUNNING
OUT ON

IT DOESN'T MATTER if it's ten below zero, and it doesn't ${ }^{\text {' }}$ matter how much it snows. It's October in Mongolia's Darhad valley, time to move the herds over 10,000 -foot mountains to winter pasture. The twice-yearly trek has shaped nomadic life here for centurics, and people love it as much as they fear it.





BY GLENN HODGES
NATIONAL GEOGRAPHIC WRITER

## PHOTOGRAPHS BY GORDON WILTSIE

THE OLD MAN HATES IT that he can't talk. As his wife tells us about his recent stroke, he pulls the blanket over his head and lies there in bed, peeking out. It's a seven-day trip over the mountains to their winter camp, she explains, and he's too weak to ride a horse. "Somehow we're going to take him," she says, "but I'm not sure how." They'll probably have to tie him to a stretcher attached to
two long poles and pull him behind an ox. It's rough terrain, and temperatures are already well below freezing.

The old man, whose name is Purevsh, pulls the blanket from his face and calls to his son to help him sit up-"da da da da da da da." Once they get his emaciated body upright, Purevsh looks around the room, his eyes brimming with tears. He knows what everyone's thinking: He's going to die in the mountains.

People have been crossing the mountains in northern Mongolia, and dying in them, for generations. When fall comes to the Darhad valley, hundreds of families load up their oxen and move their sheep, goats, and cattle to winter camps where the grass is long enough to get the herds through until spring, and where the weather is 1 good 20 degrees warmer. Between the 1,300 -square-mile valley and the winter camps stands a wall of $10,000-$ foot, snowcapped peaks that can be as brutal as they are beautiful.
By now, early October, photographer Gordon

Wiltsie and I have met many families who planned to travel along four routes through the mountains, but this is the first time we've seen life and death hanging in the balance. With us in the ger-the Mongolian term for a circular felt tent-is Cliff Montagne, a friend of Gordon's who has been working in the Darhad for six years doling out small grants and microloans as part of a regional development program he started at Montana State University. After taking a few minutes to let the family's predicament sink in, Cliff comes up with an idea: He will give Purevsh and his family money for gas, about $\$ 120$, if they can find someone to drive a truck to their winter camp-the long way, skirting the mountains.

As Purevsh's wife, Tsegmed, explains the stranger's offer to him, he swallows hard and his lip begins to quiver. "These people want to help us," she tells him gently, and the grief he's held back since we arrived pours out in a torrent of sobs. It's such a wrenching moment that everyone looks away. After $I$ time Tsegmed wipes her

CULTURED IN SPFRJTS human and ammal, the people of the
Darhad rely on leorses for transportation and shamans for gudance
Buteven out here ehange is life's only truc constant. For the price of four cows if family can bus y TV and solat-powered satellite dish.


AN ()X-BACKRIDE is sometimes dangerous and always rough, but there's no other way to go: The adults are too busy herding to babysit. With tourism and development on the horizon, the next generation may find a new path.
husband's face, lights him a cigarette and then one for herself, and they smoke with tears still in their eyes. "Virtuous people came to our house today," she says as we get up to leave. Cliff himself is crying as soon as we're out the door.

It seems like such a simple equation. "I was thinking of purchases 1 made to come on this trip-I bought a vest for $\$ 130$," Cliff says later. "I couldn't just walk away." But the irony of what Cliff has done is not lost on any of us. We came here to document this migration while it still exists-it's much of what makes life in the Darhad special, and it may be just $m$ matter of time before herders start migrating by truck instead of oxen. And here we are, making it possible for a family to travel by truck.

BEFORE I CAME TO MONGOLIA, I was enamored with the notion that you can get on a horse at one end of the country and ride all the way to the other side-roughly the distance between Denver and my home in Washington, D.C.-without hitting a fence or a paved road. When I read about Prime Minister Nambaryn

Enkhbayar's plan to build a highway across the country, and his dream of having 90 percent of the population settled in cities by 2030 ("In order to survive we have to stop being nomads," he told one reporter), I cringed. From his seat in Mongolia's capital city, Ulaanbaatar, he saw a backward country that needed to step into the modern age. From my seat in the traffic-choked streets of Washington, I saw the last unruined place.

But how do you judge salvation or ruination? Cultural change is a tricky phenomenon, bringing with it a bundle of trade-offs that aren't necessarily obvious at first glance. Consider the impact of the Soviet era. Until 1990 the Soviet Union had Mongolia in a tight lock for more than six decades. Under direction from Moscow, Mongolia's socialist government obliterated the country's Buddhist establishment, killing lamas by the thousands and destroying the temples and monasteries that were the strongest institutions that most villages had. The government pressured herders to relinquish their animals to collectives and imposed bureaucratic strictures on a people who had rarely lived by clock or ledger.

Then again, most of those people had never learned to read either, and with Soviet aid Mongolia built schools across the country and brought virtually 100 percent literacy. Pensions, free health care, and regular salaries made the lives of herders less harsh and unpredictable. Perhaps most significantly, the Soviets kept the Chinese out. China had long regarded Outer Mongolia as part of China, and it wasn't until 1921, when Russians helped oust Chinese troops, that Mongolia shook free of the Chinese yoke. One look at China's Inner Mongolia, where ethnic Mongolians have been forced to settle on smaller and smaller pastures as Chinese farmers have poured in to take the best land, and it's hard not to see the Soviets as somewhat of a salvation.

For nearly 70 years Mongolia fielded socialism's mixed bag of costs and benefits. Now that socialism is out of the picture, Mongolia faces a whole new set of trade-offs.

THE BIG NEW THING in the Darhad valley is solar-powered satellite IV. Every year a few more of the six-foot dishes dot the steppe, and at night the gers next to them grow quiet in the glow of small black-and-white sets. The dishes only pull in one channel-Mongolian Television, which
serves up an odd stew of badly dubbed Hollywood movies, judo competitions, government talking heads, and shampoo commercials-but one day soon people in the valley will surely get MTV and all the other channels available in Ulaanbaatar, and the number of dishes will multiply accordingly.

For the moment, though, most families in the Darhad still entertain the old-fashioned way, and Batnasan's family is one of them. The 49-yearold matriarch and her kids and grandkids, who live near the town of Renchinlhumbe in the central part of the valley, have agreed to let me go with them as they migrate over the mountains to the east. On my first night in their ger, seven-year-old Lhagwaanaa asks if she can sing for me. Of course, I say, and she belts out her favorite song, "My Father Is A Horseman," her voice strong and raspy like her grandmother's.
"Sing your cow song," her grandmother says.
"Now you're telling me what I should sing?" Lhagwaanaa says, drawing laughs. Then she raises her hands and sings a song of more recent vintage. "My brother is calling me from far above -he looks like he's in the sky-I want to be a construction worker just like him, in buildings way up high." Then she stops singing and begins what appears to be a familiar routine. "I want to go to the city," she announces. "I'm going to tell my father to put me on the truck to the city."

Doesn't she want to be a herder? I ask. "Why would I want to be a herder? I'm not going to be a herder! I'm going to be in the city, where I'll have clothes to wear!" With that she says a dramatic goodbye, walks out into the night air, and yells to the sky.

Life is hard in Batnasan's family. Her husband died in 1996, so she's now responsible for a household that includes two of

BAREBACK AND BAREFOOT, kids display the same Mongolian horsemanship that helped Genghis Khan's 13 th-century armies conquer much of the known world. Now the world is returning the favor, as Western economics and culture invade a country that has been relatively isolated for centuries.


her grown daughters, her son and his wife, and three grandchildren, two of them infants. It becomes clear very quickly that the family is shorthanded. When it's time to bring in the cattle and rope up the oxen, they tether the babies inside the ger and leave them crying until the job is done. "Usually men do this work," my translator, Achit, tells me. "But they don't have men."

Good thing Batnasan is tough. Her forearms are rippled with veins, and though her eyes are warm, she speaks with a masculine punch. The next afternoon, as she squats on a hill above her ger trying to find her horses with Russian binoculars, she explains how her life has changed since 1990, when socialism ended and the Soviets withdrew subsidies that had made up a third of the country's economy. She lost her job at the state-owned textile factory 70 miles away in Hatgal, where she'd worked for 20 years. Her husband lost his job at the town's school, and like thousands of people in similar circumstances across Mongolia, they returned to the herding life they had known as kids. "It was good to herd again," she says. "But now everyone has to bear his own burden. People have their own animals, but no one has cash."

I ask her what she thinks of the prime minister's idea of having nomads relocate to cities. "I don't like to think of people not herding animals, but right now it's hard to make a living without jobs." People in the capital, she says, can make as much in a month as she makes in a year.

THE WORK STARTS EARLY on migration day. Batnasan's family is up before sunrise to take down the ger and start packing the oxen, and Boldbaatar, a friend of the family who will help herd as far as the pass through the mountains, heads out to find the horses. It always takes longest to get ready the first day, they tell me, but we're moving by nine-a caravan of 400 cattle, sheep, goats, and horses, plus 17 oxen loaded with cargo that includes the two babies tucked into open crates. It's an exhilarating spectacle as we cross the sunny prairie toward the snowcapped peaks, the dogs racing through the herd, the cattle jostling for position, our wrangler Nyamhuu singing from the saddle. I pick up a few of the howls and grunts used to keep the animals mov-ing-my favorite sounds like an angry, abbreviated sneeze: "Ach!"-and gallop after strays, hollering like a madman.


With the mercury creeping toward $60^{\circ} \mathrm{F}$-rare for the second week of October-l turn to Boldbaatar and Davaanyam, Batnasan's grown son, as we whistle and holler behind the cattle. "This the best thing about being a herder?" I ask, and they both crack huge smiles. "Te," Boldbaatar says. "Yeah."

Boldbaatar, whose name means Steel Hero, has I dark intensity true to his name. His eyes are restless, his mouth long and drawn, and when he lights a cigarette, he stares at the flame of the match solemnly, like it bears some sort of wearying news. He has a bloodcurdling cry that never fails to send the sheep scurrying; it sounds like the howl of some trapped beast. And to an extent, he is trapped. He herds his animals in the summer but gives them to Batnasan for the winter because he has to stay in town for his three kids, two of whom are in school. And for those


A WRESTIER I'OASTS HIS VICTORY' in a premigration festival by flinging fermented mare's milk into the crowd. Mongolian legends claim wrestlers began wearing open-chested shirts after a woman won competitions disguised as a man.
six months he has nothing to do-there are no jobs in Renchinlhumbe, the largest of the valley's three towns, with more than a thousand people. His kids love being in school, but for him, "life in town is really hard," he says. "I wish I could stay with my animals."

The second day on the trail is as glorious as the first, and I'm at risk of getting an overly rosy idea of what migrating is like until Tsogbadrah, another friend of the family who has met up with us for a short part of the ride, tells me about his trip from his winter camp back to the Darhad in March 2000. He and his family were moving through the mountains when a blizzard struck,
dumping snow "up to a horse's stomach." He lost track of his cattle and horses, and then his wife and daughter. He had to bundle his granddaughter up in his robe to keep her from freezing and feared they were both going to die. By the time he found the camp, three of the gers had blown down and only one remained uprightwith his wife and daughter in it. "I was so relieved I cried," he says. Two of his cattle died standing, buried in snow, with holes peeking through where they had been breathing.

That year Mongolia had a dzud, a harsh winter following a dry summer that makes it hard for animals to get enough grass to survive until



MANY CHILDREN SAY ( CO() DBYE when fall comes, staying in boarding school (left) as their families migrate to winter camp. The separation can be painful. Uuganjii (above) was nine years old when he ran away from school to follow his parents. He made it 15 miles before collapsing. "I had no idea it would be so cold," he says. Found by a hunter the next day, he lost his lower legs and many of his fingers to frostbite. Unable to live as a herder, Uuganjii became an expert carpenter and carver.
spring. The next winter, another dzud; this time Tsogbadrah lost almost a fourth of his herd, and Batnasan lost more than 20 animals. By spring 2002, after three dzuds in a row, more than a fifth of Mongolia's 33 million livestock animals had died, and thousands of herders had streamed into towns and cities looking for some way to live-prompting the prime minister's comment that Mongolians had to stop being nomads in order to survive.

When Batnasan hears about Purevsh, the old man who's migrating by truck thanks to Cliff, she says, "I would go by truck if possible." This surprises me given how many times she's already said how great the migration was going and how much fun it is with us along. But it's less surprising when I remember the ruckus earlier in the day when the ox carrying the babies started mounting and butting other cattle in the herd, and when I remember that over the years a number of infants have died on the migration through these mountains.

AS CLOUDS GATHER on our third day out, we cross the high mountain pass that is our main obstacle, giving thanks for the safe passage at the summit with an offering of vodka. Our timing is perfect: That night it snows. In the morning we break camp before first light, and it's clearly a cold new season as we make our way down the dry rocky riverbeds. It's easy going though-the snow is shallow and the cattle and sheep are as fat as propane tanks. On the way back in the spring, the snow will be thick and the animals will be thin, and nothing will be this easy.

Because the summer has been so dry, there may be no water at the winter camp, so Batnasan decides to stop at a site two days short of our final destination. The family will rest several days here in the lee of a mountain ridge, then send someone ahead to check the winter camp for water. If there is none, they'll have to stay here until enough snow accumulates to provide reliable water, which could take days or weeks. The weather worsens as we wait, and on the second


day we're playing cards by the woodstove when son Davaanyam bursts into the ger.
"Wolves are chasing the horses," he says. The herd was behind the hill last night, but he's spotted wolf tracks-"the size of a palm"-and the horses are nowhere to be seen. He was out looking for a couple of hours, but it's bitterly cold, and he decided he'd better suit up and eat something before he heads out to find them. They could be a half day's ride away by now.

Davaanyam grabs a .22 rifle, and we saddle up our horses, which were tied up apart from the main herd. As we ride up the mountain behind the ger, I finally get a taste of how punishing this life can be. The wind is fierce and frigid, and my face goes from stung to numb in seconds. The terrain is steep and slowgoing in the slick snow, and I'm profoundly relieved when Davaanyam spots the horses clustered near the top of a distant ridge. We circle around and ride up the back side of the ridge so we don't scare them in the wrong direction, and there we find wolf tracks. Nyamhuu, the wrangler, grabs the rifle, and we take off on foot, my translator, Achit, and I huffing and puffing behind him. The tracks go around a rock outcropping and then double over our tracks. The wolves have been following us!

But for some reason, it seems, they've thought better of it and disappeared. Nyamhuu keeps hoping to find them in his sights somewhere on the slopes, but he'll go home without a trophy, and no one's complaining: All 30 horses are present and accounted for. We're lucky. "Every year a few horses get eaten," Davaanyam says.

By the next day the weather has cleared, and Nyamhuu, Achit, Chinbat (our cook and resident card shark), and I decide that we need to head back to the Darhad. By the time the family moves to the winter camp, the weather might be too harsh for us to make the trip back over the mountains. I give the family a fistful of chemical hand and toe warmers for those 40-below January days when they've got to chase down errant horses, and we start riding back.

As we weave through the snow-dusted canyons, Nyamhuu sings Mongolian folk songs and whistles with a warble that reminds me of a Native American flute. "My father was born here, I was too," he sings. "This land is my future. ..."

A brawny 25-year-old with a wrestler's swagger and an easy laugh, Nyamhuu tells me he loved migrating as a kid. "The migration is a lot of

work, but it's also something to look forward to," he says. "Old people say when they migrate, it lifts their spirits." Nyamhuu met his wife migrating on this very route. But his nomadic days are over. The year he got married his parents gave them 30 cows, and that same year-the dzud winter of 1999-2000-half of them died. He decided he had better options. Now he works as a wrangler for Boojum Expeditions, the Americanowned company handling logistics for Gordon, the photographer, and me. Nyamhuu is paid 25,000 tugriks a month—about \$23-plus 2,500 tugriks for each day in the field. "In the countryside it's a big salary," he says. Herders make some cash in the fall selling meat and hides and in the spring selling cashmere from their goats, but they've got to make that last for a year's worth of flour, clothing, and other necessities. "There's no herder with a monthly salary like this."


## DINNER WIL.I. BE MUTTON and noodles made from flatbread-today,

 tomorrow, and the day after. Forget about vegetables. In a land poorly suited to agriculture, people live by the maxim "meat for men, leaves for animals."With tourism on a fast uptick in the area, other herders may increasingly be able to follow Nyamhuu's lead. Already two foreign-funded tourist companies have set up shop in the DarhadBoojum and a Czech-led venture-and three more companies run operations at nearby Lake Hovsgol, which was made a national park in 1992. During a single autumn month in the Darhad I have run into travelers from Switzerland, Israel, Denmark, Italy, South Africa, France, and the United States. Five years ago, this valley was virtually undiscovered.

With no animals to herd, we make it back to Renchinlhumbe in a quick two days' ride. There
we have dinner in Nyamhuu's ger, without question the nicest one l've seen, full of new furniture and bright tapestries. The town fires up a diesel generator on winter evenings, so when the electricity comes on at $7: 30$, so does the new television. With a signal that the post office gets from a satellite and then broadcasts to the town, we watch a terrible Hollywood movie about sorority girls. After many nights on the trail spent playing cards and laughing at each other's jokes, our last two hours together are silent: The TV has the stage. And as I leave, I can't help but wonder whether Nyamhuu's one-year-old daughter will grow up singing the Mongolian songs that
brought such life to the mountains we rode through, or whether she'll grow up lip-synching with whoever happens to be the latest incarnation of Britney Spears.

MY FELLOW COUNTRYMEN, do you see the clouds in the sky? 'That's where my people are migrating. They're coming through the clouds into happiness.

So wrote Myagmarjav, a local poet, and by the time I'm ready to leave the Darhad I've seen that happiness in many faces. But l've also seen hardships along the migration route. I've seen an old woman inching up the trail on a day of below-zero temperatures, in felt boots with the bottoms falling off, grabbing her hips, moaning "yo, yo, yo, yo"-ouch, ouch, ouch, ouchfollowing her 11 -year-old granddaughter who can't go to school because the family needs her to herd their cattle. I've seen a 78 -year-old man fretting because if he dies on the trip he's not sure his daughter and two grandkids can make it without him. I've seen the ravine where a few years ago an old woman on an ox-drawn stretcher almost bled to death when she got flipped over and dragged face first down the trail (the third time she'd cheated death, she later told me). I've heard a rumor that two babies just got frostbite, and I've seen a 72-year-old grandmother nursing bruises on her face after being bucked from her spooked horse. So I understand why Batnasan wants to migrate by truck, and I'm glad when I hear that she and her family have finally arrived safely at their winter camp.

On my last night in the Darhad I go to the house of our local guide, Mishig, with a giftthe knife that has been my constant companion in this world of meat and bone and hide-and a question that I've carried just as close. The governor of this part of the valley until a few years ago, Mishig is the one who told Cliff two summers ago that someone should come document this migration before it disappears. For weeks before the migration started he showed us the culture of the valley, driving us over rutted truck tracks to introduce us to herders as they made pack bags out of leather and rope out of horsehair and felt out of wool.


Along the way it became clear that he has a deep connection with this place, and a mutual affection and respect with the people who live here. So when I ask Mishig what he thinks about the fact that the migration as we've seen it will someday end, it's not an incidental question. He's probably given it more thought than anyone.

A Harrison Ford movie is playing on the TV in his two-room house in Renchinlhumbe as we talk over boiled mutton and Korean beer. "In town you have warm houses, electricity, television," Mishig says. "When people come into town, they see this life is easier-they're not stupid. You know what I hear young people say all the time? 'I'm becoming an animal slave. I have just one life to live, but I spend it following animals.'
"Someone like you comes to Mongolia and sees how we live and thinks it's romantic, and you want to preserve it. But people who live it


IT'S A LON( $\mathrm{I}, \mathrm{HARD}$ RIDE, but Duuji will make it several times this fall to help shorthanded families move their herds over the mountains. As long as the migration lasts, it will bind people here to the land, the past, and each other.
don't think it's romantic-it's a hard life. If they can buy a truck to do the work of ten oxen-why not? Mongolia gets a third of its money in foreign aid. Do we tell the World Bank that we want to keep our people migrating on oxen?"

It's not quite what I expected him to say. Again and again I've heard him take pride in the culture of the Darhad and lament the erosion of traditional ways. When he has said that he expects people to be migrating by truck 20 years from now, for there to be roads through the mountains and bridges over rivers, I've assumed it was something he didn't want. But I was wrong. He loves the Darhad as it is, but he loves it just as
much for what it can become. And he asked us here to take a snapshot of the moment, like a parent wanting to remember his child at a certain age without wanting her to stop growing.

But when I think back to the night Lhagwaanaa sang to me in Batnasan's ger, I'm glad she hasn't grown out of her nomadic spirit just yet. Before bedtime that night I pulled out a bar of Russian "Titanic" chocolate that I got at a local shop. Lhagwaanaa looked at the wrapper, covered with misty-eyed portraits of the movie's famous lovers, and asked if she could have it.

She wanted to cut it into shapes of goats and sheep.


People don't always go quletly when they're buried in Barre, Vermont. ls this self-proclaimed "granite capital el the world," their tombstones (top) have a flair for the dramatic. The best show in town is at Hope Cemetery (right), where sorrow strikes a balance with civic pride.


## When you're looking at

 tombstones in Barre, Vermont-and everyone who comes here does-keep an eye out for the ones with carved flowers. They're trying to tell you something."A lily with a broken stem means a life cut short," says sculptor Giuliano Cecchinelli, his cap pulled so low that at certain angles the hat itself seems to be the one with the thick Italian accent.

He walks quickly; you have to hurry to keep up as he strides between the graves in hilly Hope Cemetery, the city's major tourist attraction. Like many of the men who crafted these memorials-and now rest under them-Cecchinelli, 59, was born and trained in Italy's stonecutting center, Carrara. Every so often he stoops to rub a thumb across some detail on a pale granite grave marker: a curling scroll edge carved parchment thin, an angel's downturned face. Cecchinelli's own work stands over many of the newer burial plots, but most headstones in this section are almost a century old. "Ferns mean the beginning of life. Chrysanthemums mean death. Roses are for love," he says. "And carnations-carnations mean the guy was an anarchist."

Anarchy? In this quaint Vermont setting? It turns out that Barre isn't quite what it appears. (Even the city's name-which local legend claims was chosen by the winner of a fistfight in 1793-isn't pronounced the way it's spelled. You'd better call it "Berry" or risk being asked how the drive was from New lersey.) The anarchists, who were a political presence here a hundred years ago, have faded into history. But while the city's politics are more conventional now, they remain eccentric. Barre's current mayor, Harry Monti, was elected via a write-in campaign that was a surprise to him: He was in Cancún, on vacation, at the time. The proudly blue-collar city supports the arts; rust-peppered pickup trucks jostled newer cars in the overflowing parking lot of the 1899 Barre Opera House for a recent performance of Carmen. But crowds also packed the place for the Miss Vermont pageant last year. You can rent the same stage for your kid's piano recital.

Back when the opera house opened, Barre was a boomtown, "the Chicago of New England," a newspaper called it at the time. In 1890 the population numbered nearly 7,000. By 1903 it was 12,000 and rising. Cutters and carvers from all over Europe arrived to find jobs with Barre's granite quarries and stoneworking sheds. A bustling Little Italy thrived at the city's north end as Italian marble workers came to try their hand at the harder rock. Scots, Irish, Poles, and Spaniards made lives and livings here too.

These days things are quieter. Though 57 stoneworking companies still operate


One of the largest granite quarrles on Earth, the E. L. Smith (above) plummets 550 feet deep. Most of Its yleid of Barre Gray stone is shipped around the world by the Rock of Agas Corporation. But some of it ends up as memorials In Hope Cometery (below), five milles away.


POPULLATION ABOVE GROUND: 9,300 POPULATION BELOW GROUND: 18,500 INDUSTRIES: Granite quarrying, granite cutting, granite carving, granite sales
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within city limits, cheap imported granite has reduced demand. Local quarries don't produce-or hire-the way they used to. Barre's population has dropped to just over 9,000 . Chain stores outside the city limits have sapped much of Main Street's old commercial diversity: Four pizza shops, three Chinese restaurants, and two florists have sprouted within a one-mile stretch downtown. As Harry Monti's Cadillac negotiates the afternoon traffic jam-an orderly queue of 17 cars, slowed only by drivers' polite stops for jaywalkers-he explains why a little place like this would need two flower shops. "We have," he says, smiling around his ever present cigarette, "a lot of dead people."

Barre makes a good living off of death: The boom years may be over, but more granite gravestones are still produced here than almost anywhere else in the United States. Gross sales of world-famous Barre Gray granite topped 11 million dollars last year. And Barre Gray is about the best there is. Fine-grained and impervious to weathering, it can be pulled from the earth here in huge flawless blocks. Street curbs and yuppie kitchen countertops aren't sufficiently noble uses for the stone; this stuff is meant to last the centuries. The steps of the east wing of the U.S. Capitol are made from Barre Gray. So are the grave markers of Stephen Foster, Harry Truman, John D. Rockefeller, Sr., and Col. Harland Sanders. (Does the man who invented Kentucky Fried Chicken deserve anything less?)

Hope Cemetery, where sculptor Giuliano Cecchinelli (and his hat) shows off the flower carvings, is one of three graveyards managed by the city. Only memorials made of Barre Gray are permitted there. Other than that, the options for eternal remembrance are wide open. "We allow bigger monuments than most other cemeteries," says Dwight Coffrin, whose title, Director of Cemeteries and Parks, seems to list his responsibilities in order of importance to the city. Hope also allows more unusual ones. Along with the usual crosses and cherubs, markers for the 85 -acre park's 10,500 graves include an actual-size armchair, an oversize soccer ball, an airplane, a race car, and a massive cube balanced mysteriously on its corner. A number of the stones mark empty graves. The pre-need purchase is common: Many people erect tombstones decades before they die. "That way, you know how you'll be remembered," explains Coffrin. "People want to enjoy their memorials while they're still alive." But those paying respects to their own gravesites are far outnumbered come autumn. "This

A plaster pletà serves as mother to a sturdler verslon coaxed from stone by Glullano Cecchinelli (In cap) and son Giullano If. Plastic hoses draw off rock dust. Last of Barre's Itallan-born sculptors, the elder CecchinellI crafted the model for the town's Italian-American stonecutter memorial (below), fondly known as the Itallan Stallion.


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cemetery averages 35,000 visitors during the six weeks of the fall foliage season each year, and those are just the ones on tourist buses," Coffrin says. "We don't even keep count for the rest of the year."

The rest of the year can be a problem in Barre. Despite the city's Green Mountain location, summer temperatures and humidity sometimes soar here, and the winters are numbingly cold. Just ask Pete O'Grady. In September of last year the 33-year city employee resigned as Barre's superintendent of streets to start a new life in Phoenix. The desert held an obvious appeal: O'Grady's job had involved clearing his hometown's roads of its annual average of seven feet of snow. But after only ten weeks away, O'Grady returned to Vermont in November. He'd been miserable in Phoenix. He'd hated the crowds and crime, the traffic and bureaucracy. "Everything's so complicated there," he remembers. "You have to give them your social security number and sign your life away just to get your utilities hooked up. In Barre, whatever you need, you make one call and it's done." O'Grady's former job had not been filled yet, so the city rehired him. The superintendent of streets of Barre, Vermont, picked up right where he'd left off-in time for the season's first blizzard.
"I didn't mind," says the guy who grew up on Granite Street. "It was so good to be home."

Stene lsn't cold when local artists personalize granite to reflect love (above) or a life's work: Natallno Galfettl's marker in Hope Cometory (bolow) reflects his truck-didiving past. But Nat is still very much allve. Like many in Barre ho's just planning ahead.

## WEASITE EXCLIUSIVE

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## WEAR IT WHERE IT HURTS.



## Final Edit



## MONGOLIAN CROSSING

## Have TV, Will Travel

Fascinated by the sight of a satellite dish next to a felt tent, or ger, in Mongolia's Darhad valley, photographer Gordon Wiltsie made arrangements to spend the day with a nomadic herding family and their television (powered by a solar-charged car battery). This moment-a man and boy watching a Mongolian-dubbed Russian movie-was one of the quieter ones. "People from all around came to watch this TV," Gordon says. "I also met a guy who traveled around with a pony cart carrying his VCR, TV, and generator. He'd set up shop in somebody's ger and charge maybe a quarter to play one of the 20 tapes he had."

Gordon thought the picture captured an important facet of life in the valley, but in the end he and the layout team didn't think it fit in with the rest of the photos. "With my cannera I was trying to paint a picture of a world that has existed for centuries. I relied on the writer to tell the story of what's changing and what the future might hold."

## wedsite exclusive

Cut it or keep it? Find out more about what tipped the balance for this photo-and zoom in on more Images from Mongolia-at national geographtc.com/ngm/0310

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## MONGOLIAN CROSSING Back in the Sadille Again Mhow writing assighment -also a miding assigntum

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Hodges, sent to the Darhad walley to document their migration. As Glenn puls: "They think if "vourca Westerner you can't do lanything useful" But when it came time to get on a hores कhe former Kentuckian was iceddy Hed sapplemented lis boyheod sumper camp experianse with fen ced riding les ous berore he left ht wasjust anough to nome

Toom Hike knew whatu whas doing fotle gaheping ther strave he say Whembic shins goirubbed raw his stivrup straps Clenn found d piece. rawhide, took some cord and knife and-as skeptical crowd gatheredrowatch- miade apassable pair (t chaps. "As evergone Sdrifted away t said to my transGator They didn't tlink I'dbes fable to make these; did they? He shook his hered and answered? Neither dide ?



## WTH DO WE WORK?



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SAUDI ARABIA

## World Watcher

"lot surprised me about Saudi Arabia," says Frank Viviano - and that in itself is surprising. In his nearly 30 years as a foreign correspondent, Frank has covered the fall
of the Marcos regime and the rise of the post-Soviet states, organized crime in Asia and Europe, and China's Tiananmen Square protest. For more than a decade, Frank's main beat has been the Islamic world. Yet Saudi Arabia's ethnic mix, including Arabs, Africans, Malays, and Filipinos, amazed him, as did
the country's advanced health care and road system. Enjoying considerable freedom for a Western journalist, Frank was allowed to go nearly anywhere he wanted. Seeing this shot of himself waiting to meet Crown Prince Abdullah bin Abdul Aziz al-Saud, Frank said, "I seem to resemble his predecessors."

WORLDWIDE
"They don't use the word 'gravestone' in Barre, Vermont," says writer Masgle Zackowitz, "They say monument or memorial." At Hope Cemetery, Maggle found that a memorial can say as much about the town's past as it does about In person's life. "A row of family graves, all dated the same month in 1918, telis the story of that year's deadly flu," she says. "And when you see some amazing stone inscribed with an Italian name and birthplace, it means $\quad$ stonecutter is buried there. If the dates show he died by age 50 , he probably died of silicosis, which he got from breathing the dust of the granite he worked for a living."
"My whole career has been about finding ways to take pictures in complete darkness," says Wes Sklies. To shoot the bone-strewn underworld of one of Mexico's cenotes, the veteran cave diver, felgning fright (right), began each ten-hour workday by strapping into $m$ chair harness for ${ }^{-1} 70$-foot dangle down a well shaft into the cave. Challenges in lighting the ballroom-size cavern included climbing Spiderman-style up crumbly walls to hang from its ceiling for the story's opening shot. "th took four days to set that up," Wes recalls. Was he afraid of faling? "I was more afraid of the picture not turning out."


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Avandia may cause fluid retention or swelling which could lead to or worsen heart failure, so you should


Insulth Rasstance is When your bady's colls don't always listen to Masulin telling them to wot suger in. This cen heed to type 2 datatetes.

Areruda hatps the ceitis to pay attention to your own natural Insullin, sa more suger gets into the colls the way lis supposed th. tell your doctor if you have a history of these conditions. Eyou experience an unusually rapid increase in weight, swelling or shortness of breath while taking Avandia, talk to your doctor immediately. In combination with insulin Avandia may increase the risk of other heart problems. Ask your doctor about important symptoms and I the combination continues to work for you. Avandia is not for everyone. Avandia is not recommended for patients with severe heart failure or active liver disease.
Also, blood tests to check for serious liver problems should be conducted before and during therapy. Tell your doctor if you have liver disease, or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of skin while taking Avandia.
If you are nursing, pregnant or thinking about becoming pregnant, or premenopausal and not ovulating, talk to your doctor before taking Avandia.
See important patient information on adjacent page.


## I am stronger than diabetes:

## Patient Information about AVANDIA ${ }^{*}$ (rosiglitazone maleate) $2 \mathrm{mg}, 4 \mathrm{mg}$, and 8 mg Tablets

## What is Avandia?

Avandia is one product in I class of prescription drugs called thiazolidinediones (thigh-a-zol-a-deen-die-owns) or TZDs. It is used to treat type 2 diabetes by helping the body use the insulin that it is already making. Avandia comes as pills that can be taken either once a day or twice a day to help improve blood sugar levels.

## How does Avandla treat type 2 diabetes?

If you have type 2 diabetes, your body probably still produces insulin but it is not able to use the insulin elficienlly. Insulin is needed to allow sugar to be carried from the bloodstream into many cells of the body for energy. If insulin is not being used correctly, sugar does nol enter the cells very well and builds up in the blood. If not controlled, the high blood sugar level can lead to serious medical problems, including kidney damage, blindness and amputation.
Avandia helps your body use insulin by making the cells more sensilive to insulin so that the sugar can enter the cell.

## How quickly will Avandia begin to work?

Avandia begins to reduce blood sugar levels within 2 weeks. However, since Avandia works to address an important underlying cause of type 2 diabetes, insulin resistance, it may take 8 to 12 weeks to see the full effect. If you do not respond adequately to your starting dose of Avandia, your physician may increase your daily dose to improve your blood sugar control.

## How should I take Avandia?

Your doctor may tell you to take Avandia once a day or Iwice a day (in the morning and evening). It can be taken with or without meals. Food does not affect how Avandia works. To help you remember to take Avandia, you may want to take it at the same time every day.

## What if I miss a dose?

$\$$ your doctor has prescribed Avandia for use once a day:

- As soon as you remember your missed dose, take one tablet anytime during the day.
- If you forgel and go a whole day withoul taking $\mathbf{1}$ dose. don't try to make it up by adding another dose on the following day. Forget about the missed dose and simply foilow your normal schedule.
If your doctor has prescribed Avandia for use iwice a day:
- As soon as you remember the missed dose, take one tablet.
- Take the next dose at the normal time on the same day.
- Don't try to make up in missed dose from the day before
- You should never take three doses on any single day in order to make up for a missed dose the day before.


## Do I need to test my blood for sugar while using Avandla?

Yes, you should follow your doctor's instructions about your al-home lesting schedule

## Does Avandia cure type 2 diabetes?

Currently there is no cure for diabetes. The only way to reduce the effects of the disease is to maintain good blood sugar control by following your doctor's advice for diet, exercise, weight control, and medication. Avandia, alone or in combination with other antidiabetic drugs (i.e. sulfonylureas, metformin, or insulin), may improve these other efforts by helping your body make better use of the insulin it already produces.

## Can I take Avandia with other medications?

Avandia has been taken sately by people using other medications, including other antidiabetic medications. birth control pills, warfarin (a blood thimner), Zantac
(ranitidine, an antiulcer product from GlaxoSmithKline), certain heart medications. and some cholesterol-lowering products. You should discuss with your doctor the most appropriate plan for you. If you are taking prescription or over-the-counter products for your diabeles or for conditions other than diabeles, be sure to tell your doctor. Sometimes a patient who is taking two antidiabetic medications each day can become irritable, lightheaded or excessively tired. Tell your doctor if this occurs; your blood sugar levels may be dropping too low, and the dose of your medication may need to be reduced.

## What are the possible side effects of Avandia?

Avandia was generally well tolerated in clinical trials. The most common side effects reported by people taking Avandia were upper respiralory infection (cold-like symptoms) and headache. When taking Avandia with sulfonylureas or insulin, patients may be at increased risk for low blood sugar. Ask your doctor whether you need to lower your sulfonylurea or insulin dose.
Some people may experience liredness, weight gain, or swelling with Avandia.
Avandia may cause fluid retention or swelling which could lead to or worsen heart lailure, so you should tell your doctor if you have a history of these conditions. If you experience an unusually rapid increase in weight, swelling or shortness of breath while taking Avandia, talk to your doctor immediately. In combination with insulin. Avandia may increase the risk of other heart problems. Ask your doctor about important symptoms and if the combination continues to work for you. Avandia is not for everyone. Avandia is not recommended for patients with severe heart failure or active liver disease.
Also, blood tests to check for serious liver problems should be conducted before and during therapy. Tell your doctor if you have liver disease. or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of skin while taking Avandia.
If you are nursing, pregnant or thinking about becoming pregnant, or premenopausal and not ovulating, talk to your doctor before taking Avandia, as Avandia may increase your chance of becoming pregnant.

## Who should not use Avandia?

You should not take Avandia if you are in the later stages of heart failure or if you have active liver disease. The following people should also not take Avandia: People with type I diabetes. people who experienced yellowing of the skin with Rezulin ${ }^{\text {b }}$ (troglitazone, Parke-Davis), people who are allergic to Avandia or any of its components and people with diabetic ketoacidosis.

## Why are laboratory tests recommended?

Your doctor may conduct blood tests to measure your blood sugar control. Blood tests to check for serious liver problems should be conducted before starting Avandia, every 2 months during the first year, and periodically thereafter.

It is important that you call your doctor immediately if you experience unexplained symptoms of nausea, vomiting. stomach pain, tiredness, anorexia. dark urine, or yellowing of the skin.

## How should I store Avandia?

Avandia should be stored at room temperature in a childproof container out of the reach of children. Store Avandia in its original conlainer.

## gsk GlaxoSmithKline

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## Flashback



## IRAQ'S TREASURES

## What a Relief

During the late eighth century в.c., it watched over a gate of King Sargon II's palace at Dur Sharrukin, now Khorsabad, Iraq. But this gypsum relief of a winged Assyrian god eventually went underground -buried beneath centuries of dirt after the king died and Dur Sharrukin was abandoned. An archaeological team from the University of Chicago's Oriental Institute finally uncovered the carving during the 1933-34 excavations at the site (above). Though other Khorsabad finds were shipped to Chicago, this god never flew far from home and has long been displayed at Baghdad's Iraq Museum. Perhaps the ancient deity still holds a few of its old powers of protection: It remained unharmed during last April's looting of the museum's treasures.

## WEBSITE EXCLUSIVE

You can send this month's Flashback as an electronic greeting card and access the Flashback photo archives at nationalgeographic.com/ ngm/flashback/0310.

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 know 10 and 2.
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[^0]:    Watch my preview of the Novernber issue on National Geographic Today on October 17 at $7 \mathrm{p} . \mathrm{m}$ ．and again at $10 \mathrm{p} . \mathrm{m}$ ．（ET and PT）on the National Geographic Channel．

[^1]:    We occasnonathy make our customer ust aralable to carefully screaned companies Whose prodtelts or services many be of interest ta you. Hy you prifer not to mectwe such
     International custamers please call 1 1-813-979-6845 of wethe: Mational Geogaphic Society, PD Bot 63005. Tampa. FL. 33663 3005. Please inctude the address area from your magarine wrapper when witing.

[^2]:    BACKGROUND DESIGN SABOVE: TTE HOUSE OF SAUD* IM ARAGIC CALIGRAFHY OV MAHFOUN SAKKAL

[^3]:    

[^4]:    McGuire Gituson is a profassor at Ihe thiversity of Chicago is Onental Instifufe

[^5]:    Henry Wright is a profassor at the University of Michigan's Museum of Anthropology.

[^6]:    Fom Wilknson is a rosearch associate at the University of Chicago's Orientat Institute.

